Final
Site-Specific Field Sampling Plan, Site-Specific Safety and Health Plan, and Site-Specific Unexploded Ordnance Safety Plan Attachments Former Rifle/Machine Gun Ranges, Parcels 100Q and 101Q

Fort McClellan
Calhoun County, Alabama

Task Order CK10
Contract No. DACA21-96-D-0018
IT Project No. 796887

January 2002

Revision 0

Final
Site-Specific Field Sampling Plan Attachment
Site Investigation at Former Rifle/Machine Gun Ranges, Parcels 100Q and 101Q

Fort McClellan
Calhoun County, Alabama

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Revision 0

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See Attachment 1, List of Abbreviations and Acronyms.

Executive Summary

In accordance with Contract Number DACA21-96-D-0018, Task Order CK10, IT Corporation (IT) will conduct site investigation (SI) activities at the Former Rifle/Machine Gun Ranges, Parcels 100Q and 101Q, at Fort McClellan, Calhoun County, Alabama, to determine the presence or absence of potential site-specific chemicals at this site. The purpose of this site-specific field sampling plan is to provide technical guidance for sampling activities at the Former Rifle/Machine Gun Ranges, Parcels 100Q and 101Q.

The Former Rifle/Machine Gun Ranges, Parcels 100Q and 101Q, are located in the north-central area of the Main Post of Fort McClellan. Parcels 100Q and 101Q are the primary ranges of concern for the area of investigation. The range fans for parcels 100Q and 101Q cover an area of approximately 3,790 and 14 acres, respectively. However, the area of investigation for this SI will be limited to an approximately 25-acre area that incorporates the firing lines and only a portion of the range fans. The likely impact areas of these ranges extend beyond the area of investigation for this SI and will be addressed in the SI for Area North of Military Operations in Urban Terrain Site and the SI for Small Arms Impact Area, South of the Former Prisoner of War Training Facility, Former Rifle/Machine Gun Ranges, Parcels 100Q and 101Q.

In addition to Parcels 100Q and 101Q described in the environmental baseline survey (EBS), portions of five other ranges identified in the *Archives Search Report, Maps, Fort McClellan, Anniston, Alabama* (ASR) overlap the area of investigation and are included in this SI. These ranges were not described in either the EBS or shown on any of the EBS figures. Only two of the five ranges shown in the ASR were named and described. The likely impact areas for these ASR ranges extend beyond the area of investigation for this SI and will be addressed in the SIs mentioned in the previous paragraph.

IT will collect 21 surface soil samples, 21 subsurface soil samples, 3 groundwater samples, 3 surface water samples, and 3 sediment samples at this site. Potential contaminant sources at the Former Rifle/Machine Gun Ranges, Parcel 100Q and 101Q, are primarily unknown but may include explosive compounds and metals. All the samples collected during the SI will be analyzed for explosives and metals. Ten percent of the samples collected will also be analyzed for volatile organic compounds, semivolatile organic compounds, pesticides, and herbicides. In addition, sediment samples will be analyzed for total organic carbon and grain size. Results from these analyses will be compared with site-specific screening levels, ecological screening values,

and background screening values to determine if potential site-specific chemicals are present at the site at concentrations that pose an unacceptable risk to human health or the environment.

1.0 Project Description

1.1 Introduction

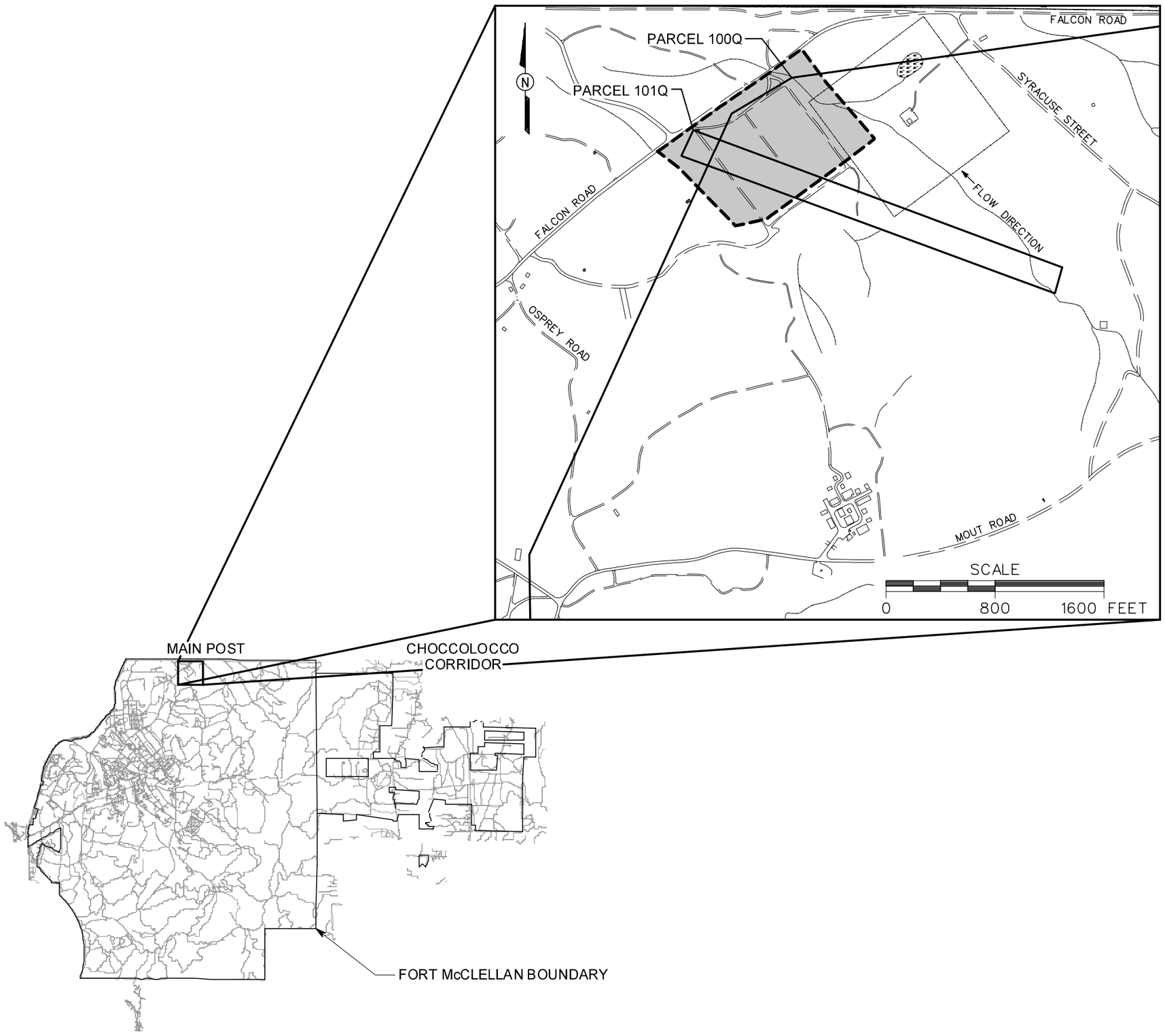
The U.S. Army is conducting studies of the environmental impact of suspected contaminants at Fort McClellan (FTMC) in Calhoun County, Alabama, under the management of the U.S. Army Corps of Engineers (USACE)-Mobile District. The USACE has contracted IT Corporation (IT) to provide environmental services for the site investigation (SI) of Former Rifle/Machine Gun Ranges, Parcels 100Q and 101Q, under Task Order CK10, Contract Number DACA21-96-D-0018.

This site-specific field sampling plan (SFSP) attachment to the installation-wide sampling and analysis plan (SAP) (IT, 2000a) for FTMC has been prepared to provide technical guidance for sample collection and analysis at an area of investigation encompassing portions of Former Rifle/Machine Gun Ranges, Parcels 100Q and 101Q. This SFSP will be used in conjunction with the site-specific safety and health plan (SSHP) and the site-specific unexploded ordnance (UXO) safety plan developed for the site and the installation-wide work plan (WP) (IT, 1998) and SAP. The SAP includes the installation-wide safety and health plan, waste management plan, ordnance and explosives management plan, and quality assurance plan (QAP). Site-specific hazard analyses are included in the SSHP.

1.2 Site Description and History

Former Rifle/Machine Gun Ranges, Parcels 100Q and 101Q, are located in the north-central area of the FTMC Main Post (Figure 1-1). Parcels 100Q and 101Q are the primary ranges of concern for the area of investigation as defined in the environmental baseline survey (EBS) (Environmental Science and Engineering, Inc. [ESE], 1998). The range fans for parcels 100Q and 101Q cover an area of approximately 3,790 and 14 acres, respectively. However, the area of investigation for this SI will be limited to an approximately 25-acre area that incorporates the firing lines and only small portions of the range fans (Figure 1-2). The portion of Parcels 100Q and 101Q that extends south of the area of investigation, including probable impact areas, will be addressed in the SI for Area North of Military Operations in Urban Terrain Site and Small Arms Impact Area South of the Former Prisoner of War Training Facility, Former Rifle/Machine Gun Ranges, Parcels 100Q and 101Q (IT, 2001, 2002).

According to the EBS, Former Rifle/Machine Gun Ranges, Parcels 100Q and 101Q, are two of seven former rifle/machine gun ranges that were identified in the northern part of the Main Post.



LEGEND

- UNIMPROVED ROADS AND PARKING
- PAVED ROADS AND PARKING
- BUILDING
- TREES / TREELINE
- MARSH / WETLANDS
- PARCEL BOUNDARY
- AREA OF INVESTIGATION
- SURFACE DRAINAGE / CREEK
- FENCE

FIGURE 1-1
SITE LOCATION MAP
FORMER RIFLE / MACHINE GUN RANGES
PARCELS 100Q AND 101Q

U. S. ARMY CORPS OF ENGINEERS
MOBILE DISTRICT
FORT McCLELLAN
CALHOUN COUNTY, ALABAMA
Contract No. DACA21-96-D-0018

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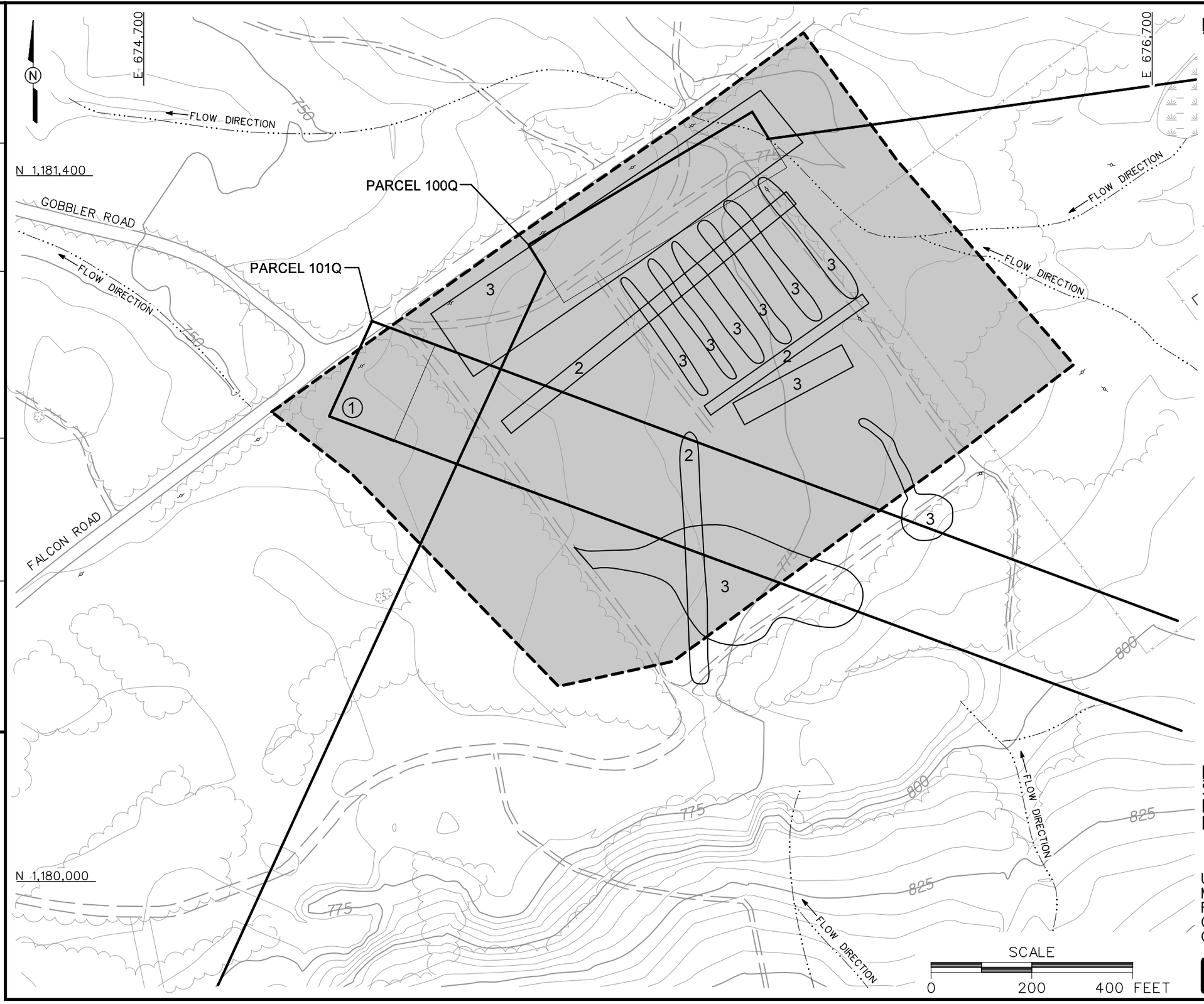
PROJ. MGR.: J. YACOUB	PROJ. NO.: 796887
INITIATOR: J. REMO	DWG. NO.: ...\796887es.230
ENGR. CHCK. BY: S. MORAN	
DRAFT. CHCK. BY:	



LEGEND

- UNIMPROVED ROADS AND PARKING
- PAVED ROADS AND PARKING
- TOPOGRAPHIC CONTOURS (CONTOUR INTERVAL - 5 FOOT)
- TREES / TREELINE
- MARSH / WETLANDS
- AREA OF INVESTIGATION
- FIRING LINES
- SURFACE DRAINAGE / CREEK
- FENCE
- UTILITY POLE

TRAINING AIDS/PHYSICAL FEATURES OBSERVED

1. MOUNDS IDENTIFIED DURING SITE WALK
2. BERM IDENTIFIED ON AERIAL PHOTOGRAPHS
3. DISTURBED AREA IDENTIFIED ON AERIAL PHOTOGRAPHS

SCALE
0 200 400 FEET

FIGURE 1-2
SITE MAP
FORMER RIFLE/MACHINE GUN RANGES
PARCELS 100Q AND 101Q

U. S. ARMY CORPS OF ENGINEERS
MOBILE DISTRICT
FORT McCLELLAN
CALHOUN COUNTY, ALABAMA
Contract No. DACA21-96-D-0018

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INITIATOR: J. REMO
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The dates of operation and types of ordnance fired at these ranges are unknown. According to historical maps, four ranges were in use in 1917. However, it is unclear which four of the seven former ranges were active at that time. The remaining three ranges appear on later historical maps (1959 and 1966).

Based on the orientation of the firing lines and range fans presented in the EBS, the direction of fire for Parcels 100Q and 101Q was to the southeast (Figure 1-2). Although impact areas for these ranges were not identified in the EBS, the most likely impact area is the hillside located southeast of the firing lines (Figure 1-2).

Parcels 100Q and 101Q are located south of Falcon Road near its intersection with Gobbler Road. The topography in the area of investigation gently slopes to the northwest. The elevation across this area ranges between 760 to 780 feet above mean sea level. Two intermittent streams converge in the eastern portion of the area of investigation and form a single stream that flows through the northeast corner of the site (Figure 1-2). This unnamed intermittent stream flows northwest, eventually emptying into Reilly Lake.

During site walks conducted by IT personnel in October 2001, only a few small mounds were noted near the firing line for Parcel 101Q. A majority of the area of investigation was covered with grass-like vegetation, with the exception of brush and trees growing along the eastern and western boundaries of the area of investigation (Figure 1-2).

1.2.1 Archives Search Report Ranges

In addition to Parcels 100Q and 101Q described in the EBS, five other ranges (areas) were shown for the area of investigation on Plates 3, 4, 5, and 6 of the *Archives Search Report, Maps, Fort McClellan, Anniston, Alabama* (ASR) (USACE, 1999a). These ranges were not described in the EBS. Figures 1-3, 1-4, 1-5, and 1-6, taken from the ASR map plates, show the additional ranges that overlap in the study area. Each of the ASR plates represents a different time period of range use at FTMC are as follows:

- Plate 3 - World War I Use
- Plate 4 – Inter-War Range Use (World War I to World War II)
- Plate 5 – World War II to 1950 Range Use
- Plate 6 – 1950 to 1973 Range Use.

Table 1-1 briefly describes each the ASR ranges and lists the number of the figure in this SFSP that shows the range. Three of the ranges are not named or described in the ASR.

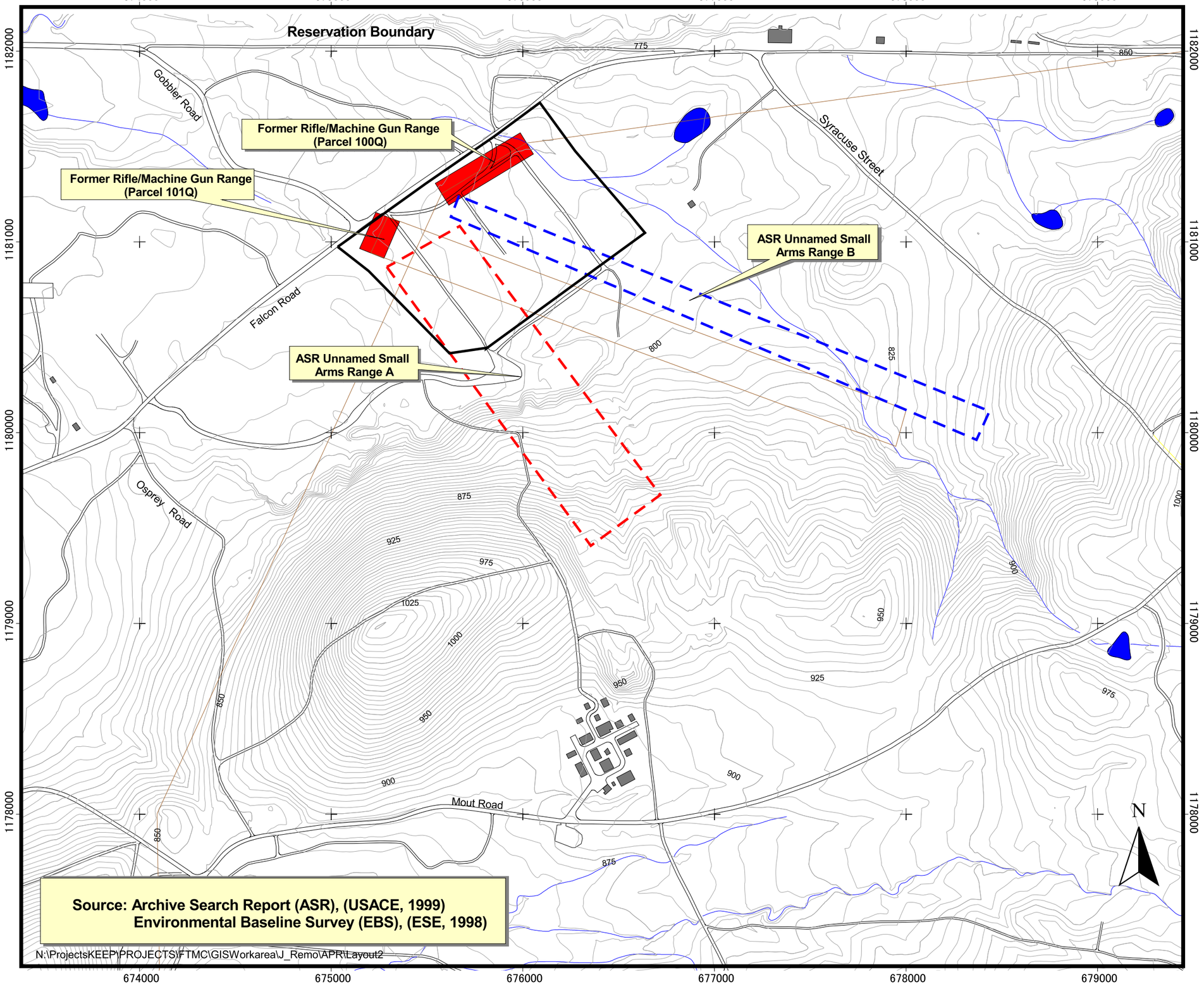

Figure 1-3

ASR Plate 3 Range Location Map

Former Rifle/Machine Gun Ranges
Parcel 100Q and 101Q
Fort McClellan, Alabama

Legend

- EBS Firing Lines
- EBS Range Fan
- Area of Investigation
- ASR Unnamed Small Arms Range A
- ASR Unnamed Small Arms Range B
- Roads
- Streams
- Topographic Contours 5 Foot Intervals
- Buildings
- Lake

500 0 500 Feet

NAD83 State Plane Coordinates

U.S. Army Corps of Engineers
Mobil District

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Figure 1-4

ASR Plate 4 Range Location Map

Former Rifle/Machine Gun Ranges
Parcels 100Q and 101Q
Fort McClellan, Alabama

Reservation Boundary
Tank Combat Range (OA-11)
Former Rifle/Machine Gun Range (Parcel 100Q)
Former Rifle/ Machine Gun Range (Parcel 101Q)
ASR Unnamed Small Arms Range B
ASR Unnanmed Small Arms Range A
Gobbler Road
Syracuse Street
Falcon Road
Osprey Road
Mout Road

674000 675000 676000 677000 678000 679000
1182000 1181000 1180000 1179000 1178000

Source: Archive Search Report (ASR), (USACE, 1999)
Environmental Baseline Survey (EBS), (ESE, 1998)

N:\ProjectsKEEP\PROJECTS\FTMC\GISWorkarea\J_Remo\APR\Layout3

Legend

- EBS Firing Lines
- EBS Range Fan
- Area of Investigation
- Tank Combat Range (OA-11)
- ASR Unnamed Small Arms Range A
- ASR Unnamed Small Arms Range B
- Roads
- Streams
- Topographic Contours 5 Foot Intervals
- Buildings
- Lake

500 0 500 Feet

NAD83 State Plane Coordinates

U.S. Army Corps of Engineers
Mobil District

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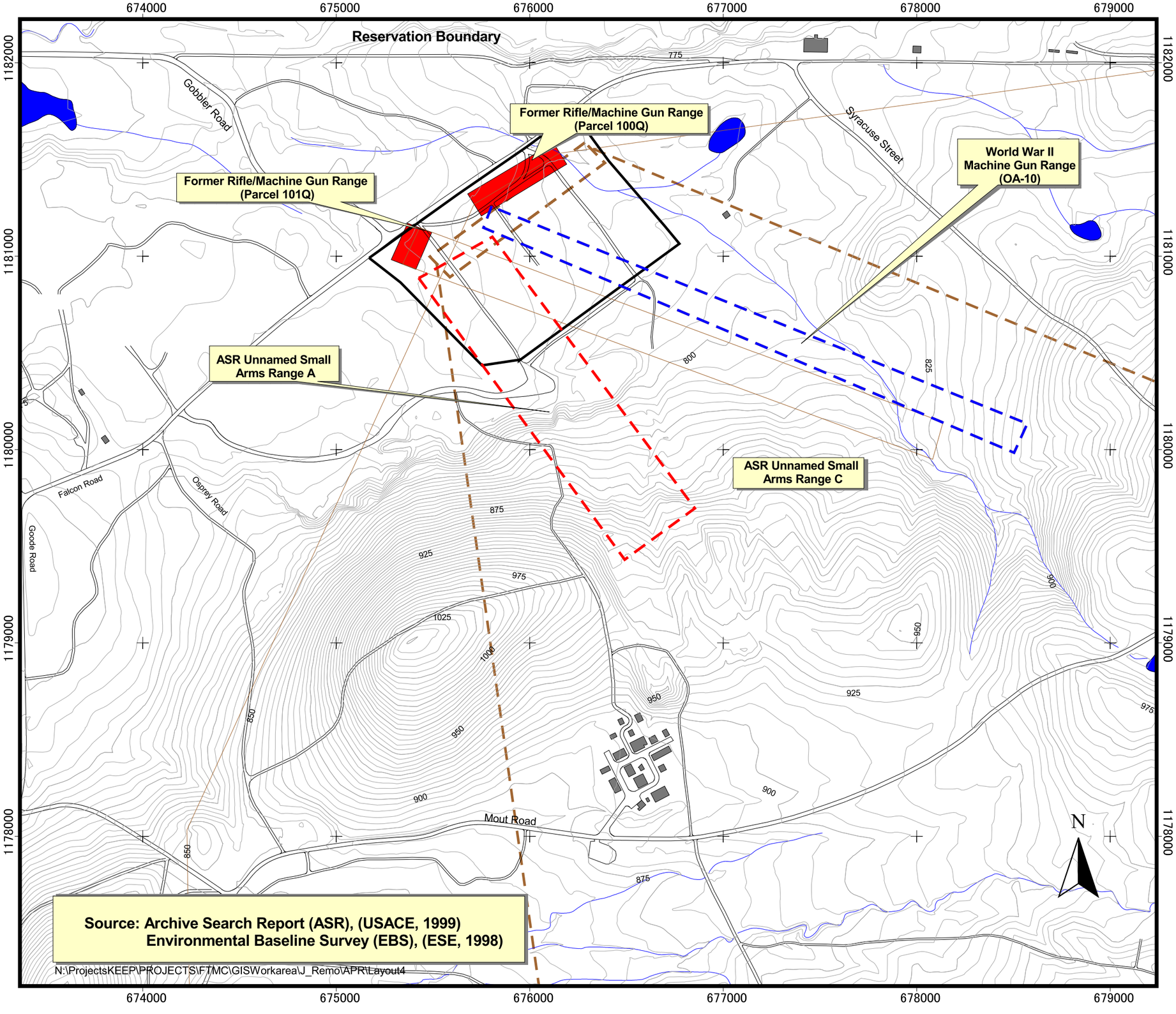

Figure 1-5

ASR Plate 5 Range Location Map

Former Rifle/Machine Gun Ranges
Parcels 100Q and 101Q
Fort McClellan, Alabama

Legend

- EBS Firing Lines
- EBS Range Fan
- Area of Investigation
- World War II Machine Gun Range (OA-10)
- ASR Unnamed Small Arms Range A
- ASR Unnamed Small Arms Range C
- Roads
- Streams
- Topographic Contours 5 Foot Intervals
- Buildings
- Lake

500 0 500 Feet

NAD83 State Plane Coordinates

U.S. Army Corps of Engineers
Mobil District

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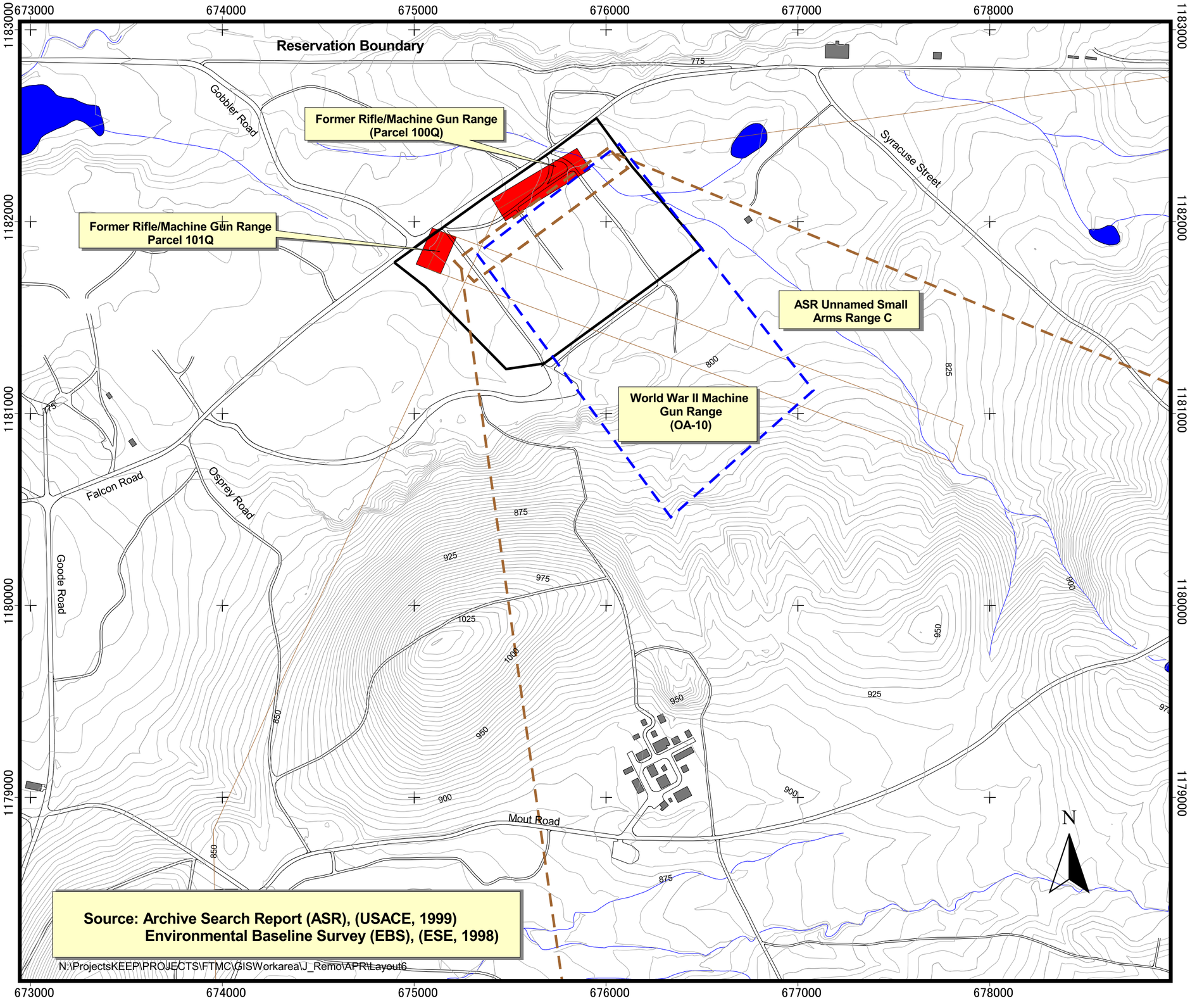

Source: Archive Search Report (ASR), (USACE, 1999)
Environmental Baseline Survey (EBS), (ESE, 1998)

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Figure 1-6

ASR Plate 6 Range Location Map

Former Rifle/Machine Gun Ranges
Parcels 100Q and 101Q
Fort McClellan, Alabama

Legend

- EBS Firing Lines
- EBS Range Fan
- Area of Investigation
- World War II Machine Gun Range (OA-10)
- ASR Unnamed Small Arms Range C
- Roads
- Streams
- Topographic Contours 5 Foot Intervals
- Buildings
- Lake

500 0 500 Feet

NAD83 State Plane Coordinates

U.S. Army Corps of Engineers
Mobil District

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Contract No. DACA21-96-D-0018

Table 1-1

ASR Range Descriptions
Former Rifle/ Machine Gun Parcels 100Q and 101Q
Fort McClellan, Calhoun County, Alabama

Range Name	ASR Number	Site Description	Figure 1-3 Plate 3[a]	Figure 1-4 Plate 4[a]	Figure 1-5 Plate 5[a]	Figure 1-6 Plate 6[a]	Impact Area Location
World War II Machine Gun Range	OA-10	According to the ASR this machine gun range was built during World War II and includes part of the World War I, 1,000-yard rifle range. In 1967 it was still being used as a Squad/Platoon Attack Course and later it was abandoned. This range also lies in the area designated during the Inter-War period as a Tank Combat Range. The maps indicate the range layout has changed over time, but based on the orientation of the range fans the direction of fire appears to be to the southeast.			X	X	The impact area is not identified in the EBS. However, based on the orientation of the firing line and range fan the impact area appears to be southeast of the area of investigation. The likely impact area will be addressed in additional site investigations.
Tank Combat Range	OA-11	According to the ASR this range appears on several maps during the Inter-War period. The range boundaries and exactly how the range was utilized are unknown. Possibile uses for this range include: driver training, tactical maneuvers, or main-gun firing.		X			The impact area is not identified in the ASR. A likely impact area could not be determined from the orientation of the range.
ASR Unnamed Small Arms Range A	NA	ASR Unnamed Small Arms Range A appears on Plates 3, 4, and 5 spanning time periods from World War I through World War II. These plates indicate that this range was a small arms range but provide no other information about the range. Based on the orientation of the range fan the firing line appears to be southeast of intersection of Falcon and Gobbler Roads with the direction of fire toward the southeast.	X	X	X		The impact area is not identified in the ASR. However, based on the range's orientation, the most likely location for the impact area is the hillside to the southeast. The likely impact area will be adressed in an additional site investigations.

Table 1-1

ASR Range Descriptions
Former Rifle/ Machine Gun Parcels 100Q and 101Q
Fort McClellan, Calhoun County, Alabama

Range Name	ASR Number	Site Description	Figure 1-3 Plate 3[a]	Figure 1-4 Plate 4[a]	Figure 1-5 Plate 5[a]	Figure 1-6 Plate 6[a]	Impact Area Location
ASR Unnamed Small Arms Range B	NA	ASR Unnamed Small Arms Range B appears on Plates 3 and 4 spanning time periods from World War I and the Inter-War Period. The plates indicate that this range was a small arms range but provide no other information about the range. Based on the orientation of the range fan the firing line appears to be south of intersection of Falcon and Gobbler Roads. This range is similar in location and orientation as EBS Parcel 101Q. This range fan may be intended to represent Parcel 101Q.	X	X			The impact area is not identified in the ASR. However, based on the orientation of the range and firing lines of surrounding ranges, the impact area appears to be southeast of the area of investigation. The likely impact area will be adressed in an additional site investigations.
ASR Unnamed Small Arms Range C	NA	ASR Unnamed Small Arms Range C appears on Plates 5 and 6 during the World War II era through 1973. These plates indicate that this range was a small arms range but provide no other information about the range. Based on the position of the EBS firing lines from other ranges in close proximity and the orientation of the range fan, the firing line appears to be south of Falcon Road with the direction of fire being to the southeast. Unnamed Range C has a similar orientation, shape, and location as EBS Parcel 100Q. This range fan may be intended to represent Parcel 100Q.			X	X	The impact area is not identified in the ASR. However, based on the orientation of the range and firing line of surrounding ranges, the impact area appears to be southeast of the area of investigation. The likely impact area will be adressed in an additional site investigations.

[a] Corresponds to the Map Plate Number from the July 1999 U.S. Army Corps of Engineers ***Archive Search Report, Maps, Fort McClellan, Anniston, Alabama.***

NA - Not available.

ASR-July 1999 U.S. Army Corps of Engineers ***Archive Search Report, Maps, Fort McClellan, Anniston, Alabama.***

X - Denotes the figure where the listed range is shown in this SFSP. Figures 1-3, 1-4, 1-5, and 1-6 show historic ranges from the ASR plate number shown in relation to the EBS assigned parcels in the area of investigation.

Plate 3 of the ASR. Plate 3 of the ASR shows two small arms ranges in the area of investigation for this SI. These two ranges are not named or described in the ASR. The ranges are identified in Table 1-1 and on Figure 1-3 as ASR Unnamed Small Arms Range A and Unnamed Small Arms Range B. Unnamed Small Arms Range A overlaps with both EBS Parcels (100Q and 101Q). Unnamed Small Arms Range B falls within EBS Parcel 100Q and may be inferred to represent Parcel 101Q because of their similar location and orientation. The orientation of ASR Unnamed Small Arms Range A and Unnamed Small Arms Range B and the location of firing lines presented in the EBS for Parcels 100Q and 101Q suggest the direction of fire to be toward the southeast. The likely impact area for ASR Unnamed Small Arms Range A and Unnamed Small Arms Range B is the hillside located southeast of the area of investigation (Figure 1-3). Only the portion of Unnamed Small Arms Ranges A and B located within the area of investigation will be addressed in this SI (Figure 1-3). The portions of Unnamed Small Arms Ranges A and B located south of the area of investigation, including the likely impact areas, will be addressed in additional SIs.

Plate 4 of the ASR. Plate 4 of the ASR (Figure 1-4) shows three ranges: Unnamed Small Arms Range A, Unnamed Small Arms Range B, and Tank Combat Range (OA-11). Unnamed Small Arms Ranges A and B are located in the same location and with the same orientation as in Plate 3. The Tank Combat Range (OA-11) encompasses a significant portion of the north-central portion of the Main Post including the entire area of investigation for this SI. According to the ASR, the Tank Combat Range appears on several maps during the Inter-War period. The range boundaries and exactly how the range was used are unknown. Possible uses for this range include driver training, tactical maneuvers, or main gun firing (USACE, 1999a). The ASR did not identify firing points or impact areas. Firing points, direction of fire, or impact areas could not be inferred from the shape or orientation of this range. Only the portion of the Tank Combat Range (OA-11) that falls within the area of investigation will be addressed in this SI.

Plate 5 of the ASR. Plate 5 of the ASR (Figure 1-5) shows three ranges: ASR Unnamed Small Arms Range A, ASR Unnamed Small Arms Range C, and World War II Machine Gun Range (OA-10). The range identified as Unnamed Small Arms Range B in Plates 3 and 4 is identified as World War II Machine Gun Range (OA-10) on Plate 5. According to the ASR, this machine gun range was built during World War II. In 1967 it was still being used as a Squad/Platoon Attack Course; it was later abandoned (USACE, 1999a). The likely impact area for the World War II Machine Gun Range (OA-10) within the area of investigation (Figure 1-5). Only the portion of OA-10 within the area of investigation will be addressed in this SI.

Unnamed Small Arms Range A is shown in the same location and with the same orientation in Plate 5 as in Plates 3 and 4. ASR Unnamed Small Arms Range C overlaps both EBS parcels. Unnamed Small Arms Range C has a similar shape, orientation, and location as EBS Parcel 100Q and may be intended to represent Parcel 100Q (Figure 1-5). The portions of World War II Machine Gun Range (OA-10), and ASR Unnamed Small Arms Ranges A and C located south of the area of investigation, including the likely impact areas, will be addressed in additional investigations.

Plate 6 of the ASR. Plate 6 of the ASR (Figure 1-6) shows two ranges, the World War II Machine Gun Range (OA-10) and ASR Unnamed Small Arms Range C. The World War II Machine Gun Range (OA-10) on Plate 6 of the ASR is in a different location and has a different range shape than that shown on Plate 5. As shown on Plate 6, the World War II Machine Gun Range is located within Parcel 100Q and overlaps Parcel 101Q. The new location and range shape for the World War II Machine Gun Range (OA-10) probably reflects the change of this range from a machine gun range to a Squad/Platoon Attack Course. ASR Unnamed Small Arms Range C is in the same location and has the same orientation as in Plate 5. The portions of World War II Machine Gun Range (OA-10) and ASR Unnamed Small Arms Range C located south of the area of investigation, including the likely impact areas, will be addressed in additional SIs.

1.2.2 Aerial Photographs

Available aerial photographs were reviewed to reveal any land-use activity in the study area, and attempts were made to match the review of the photographs to the FTMC range-use records in the EBS and ASR. The following is a summary of the review of available aerial photographs.

1937. The 1937 aerial photograph shows most of the area of investigation to be wooded (Figure 1-7). The three ranges shown on ASR Plate 3 (World War I Use) that could correspond to the active areas shown on the photograph are the Tank Combat Range (OA-11) and Unnamed Small Arms Ranges A and B. The aerial photograph did not reveal any activity related to these ranges within the area of investigation.

1940. The 1940 aerial photograph shows that activity within the area of investigation has increased (Figure 1-8). Most of the trees within the area of investigation have been removed. One prominent berm is noted approximately 1,000 feet south of the area of investigation. The

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1181000 1180500 1180000

This map employs uncontrolled aerial photographs. The resulting distortions affect the spatial accuracy of the photographs.

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Figure 1-7

1937 Aerial Photograph - Inter-War Range Use

Former Rifle/Machine Gun Ranges
Parcels 100Q and 101Q
Fort McClellan, Alabama

Legend

- Area of Investigation
- EBS Range Fan Former Rifle/ Machine Gun Range Parcel 100Q
- EBS Range Fan Former Rifle/ Machine Gun Range Parcel 101Q

200 0 200 Feet

NAD83 State Plane Coordinates

N

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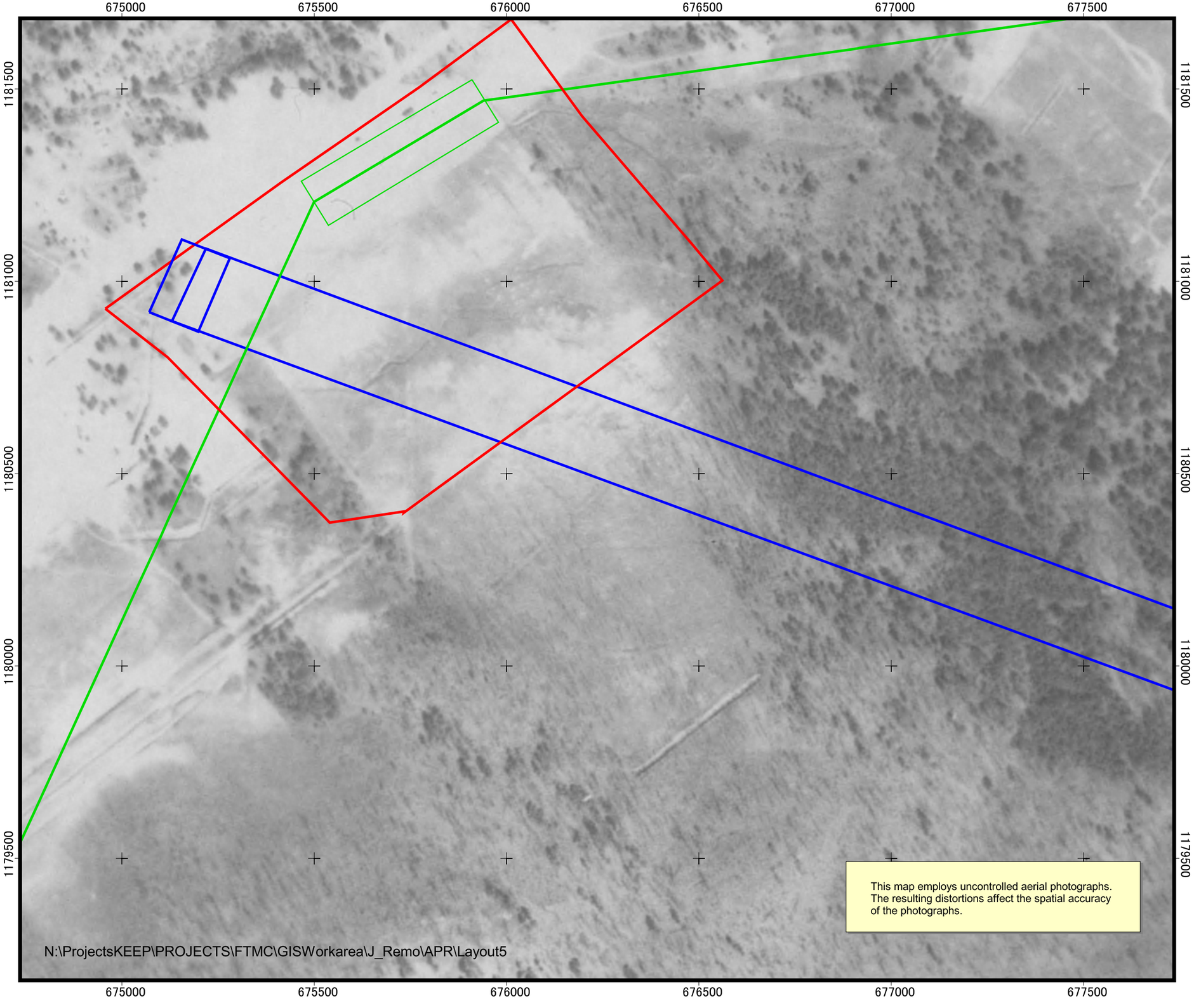

Figure 1-8

1940 Aerial Photograph - Inter War Range Use

Former Rifle/ Machine Gun Ranges
Parcels 100Q and 101Q
Fort McClellan, Alabama

Legend

- Area of Investigation
- EBS Range Fan Former Rifle/ Machine Gun Range Parcel 100Q
- EBS Range Fan Former Rifle/ Machine Gun Range Parcel 101Q

200 0 200 Feet

NAD83 State Plane Coordinates

N

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berm appears to be consistent with target berms. A small structure is also noted near the firing line for Parcel 100Q. From this photograph, it appears that Parcel 100Q was in use at this time.

The three ranges shown on ASR Plate 3 for this time period that could correspond to the active areas shown on the 1940 aerial photograph are the Tank Combat Range (OA-11) and the ASR Unnamed Small Arms Ranges A and B. Activity related to the Tank Combat Range (OA-11) and ASR Unnamed Small Arms Range B could not be determined. The orientation of berms south of the area of investigation indicated the possible use of ASR Unnamed Small Arms Range A. However, these berms may be related to range activity at Parcel 100Q.

1944. The 1944 aerial photograph shows land-use activity very similar to that seen on the 1940 photograph with continued activity within the area of investigation. It appears that both EBS ranges (Parcels 100Q and 101Q) may have been in use at this time (Figure 1-9). Portions of three ASR ranges (World War II Machine Gun Range [OA-10] and ASR Unnamed Small Arms Ranges A and C) were identified within the area of investigation during this time. The overlap of these ASR ranges with the EBS ranges makes it difficult to discern if the ASR or EBS ranges were in use.

1954, 1961, and 1964. The 1954 aerial photograph shows three berms within the area of investigation. A new road was identified on the 1961 aerial photograph running northwest-southeast in the western portion of the area of investigation. The 1964 aerial photograph reveals an oval road in the southern portion of the area. In addition, a barren area is located parallel to and approximately 500 feet from the firing line for Parcel 100Q (Figure 1-10).

The new berms, the two new roads, and the bare area, together with the continued lack of vegetative cover in the area of Parcels 100Q and 101Q, indicate continued activity at these ranges from 1954 through 1964.

1969 and 1973. The 1969 and 1973 aerial photographs show continued range activity at Parcel 100Q. Six cleared areas suggestive of bullet channels beginning near the firing line for Parcel 100Q and extending in a perpendicular manner to the firing line for approximately 300 feet are apparent on both the 1969 and 1973 aerial photographs. A circular disturbed area, possibly a target area, was also noted on the 1973 aerial photograph along the south boundary of the area of investigation (Figure 1-11). These two aerial photographs also show an increase in the growth

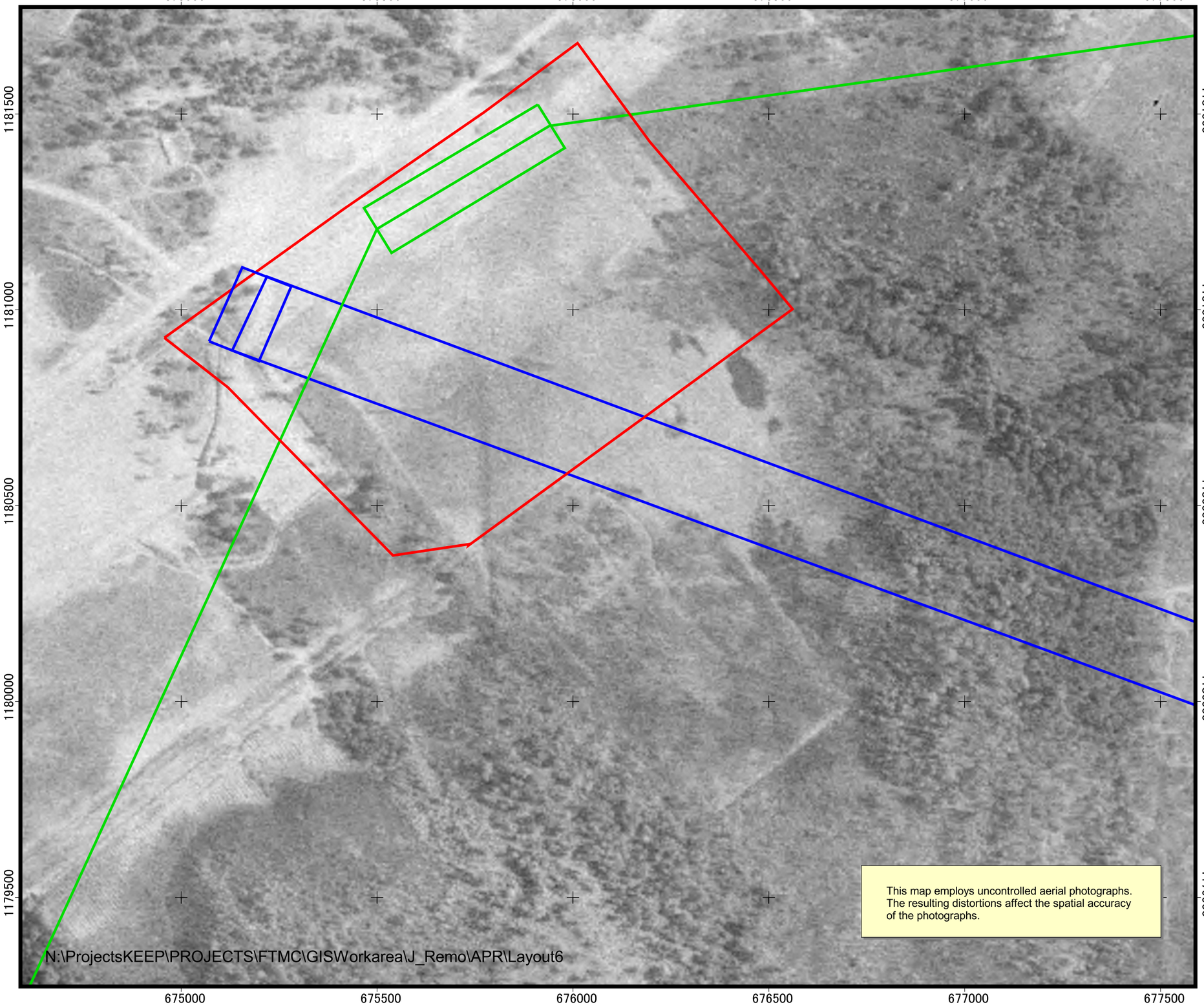

Figure 1-9

1944 Aerial Photograph-
WW II to 1950 Range Use

Former Rifle/Machine Gun Ranges
Parcels 100Q and 101Q
Fort McClellan, Alabama

Legend

- Area of Investigation
- EBS Range Fan Former Rifle/ Machine Gun Range Parcel 100Q
- EBS Range Fan Former Rifle/ Machine Gun Range Parcel 101Q

200 0 200 Feet

NAD83 State Plane Coordinates

N

U.S. Army Corps of Engineers Mobile District

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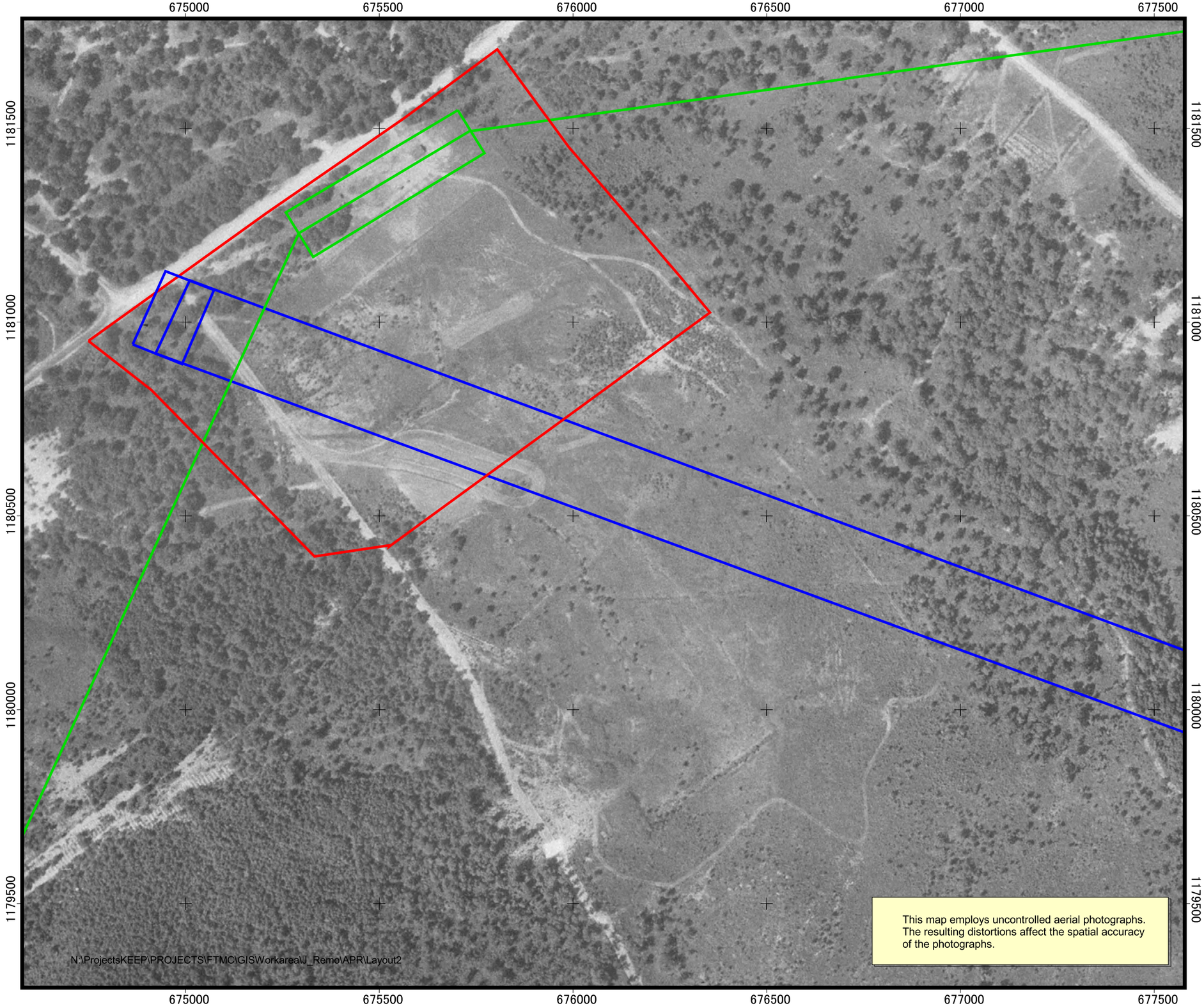

Figure 1-10

1964 Aerial Photograph-
1950 to 1973 Range Use

Former Rifle/Machine Gun Ranges
Parcels 100Q and 101Q
Fort McClellan

Legend

- Area of Investigation
- EBS Range Fan Former Rifle/ Machine Gun Range Parcel 100Q
- EBS Range Fan Former Rifle/ Machine Gun Range Parcel 101Q

200 0 200 Feet

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Figure 1-11

1973 Aerial Photograph- 1973 to Present Range Use

Former Rifle/Machine Gun Ranges
Parcels 100Q and 101Q
Fort McClellan, Alabama

Legend

- Area of Investigation
- EBS Range Fan Former Rifle/ Machine Gun Range Parcel 100Q
- EBS Range Fan Former Rifle/ Machine Gun Range Parcel 101Q

200 0 200 Feet

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near the firing line for Parcel 101Q, possibly suggesting discontinued use of the range during this time period.

Between 1954 and 1973 the ASR identified two ranges in use: the World War II Machine Gun Range (OA-10) and ASR Unnamed Small Arms Range C. These two ranges overlap with Parcel 100Q. Due to the extent of overlap involved with these ranges, it is not possible to discern from these aerial photographs which of these ranges were active during this time period.

1976. The 1976 aerial photograph shows that a majority of the trees have been removed from the area of investigation and from areas to the north and west. However, an increase in vegetation is evident across Parcel 100Q, suggesting discontinued use of the range. Though the portions of Parcels 100Q and 101Q within the area of investigation have been cleared, no distinctive land-use activities can be discerned. The EBS and the ASR indicate no range activity within the area of investigation after 1973 (ESE, 1998; USACE, 1999a).

1982, 1994, and 1998. The 1982 aerial photograph shows a prisoner-of-war (POW) training facility within the area of investigation (Figure 1-12). This facility is also observed on 1994 and 1998 aerial photographs. The POW training facility encompasses most of the area of investigation and overlaps the range fans for Parcels 100Q and 101Q. Therefore, the ranges had been abandoned by this time period. The POW training facility was removed in 1999.

1.2.3 Soil Types

Soils mapped within the area of investigation consist of the following three soil types: the Cumberland gravelly loam, the Anniston and Allen gravelly loam, and the Anniston gravelly clay loam (U.S. Department of Agriculture [USDA], 1961). The Cumberland gravelly loam underlies the majority of the site with a combination of the Anniston and Allen gravelly loam and the Anniston gravelly clay loam underlying only the southwest corner of the area of investigation. The Cumberland gravelly loam is generally developed in old alluvium that washed from soils derived mainly from limestone, cherty limestone, shale, and sandstone. The surface soil of the Cumberland gravelly loam ranges from very dark brown to reddish brown. The subsoil ranges from dark red to red in color and from silty clay loam to clay in texture. The thickness of the alluvium ranges from 2 feet to greater than 15 feet. Some areas included in this soil mapping unit have a silt loam to gravelly fine sandy loam surface soil which are generally underlain in places by beds of gravel or sand. Rounded chert, sandstone, and quartz gravel, as

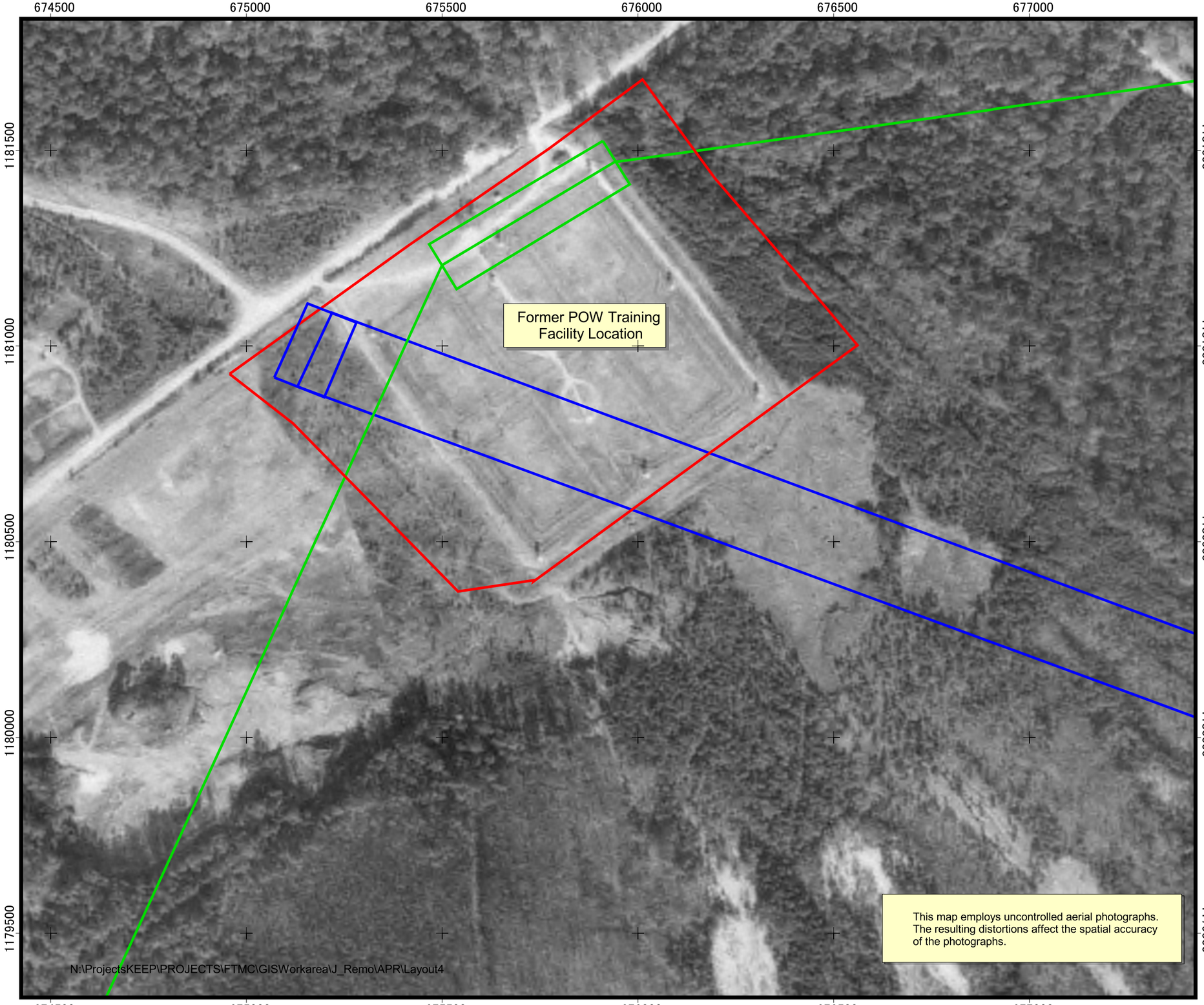

Figure 1-12

1982 Aerial Photograph- 1973 to Present Range Use

Former Rifle/Machine Gun Ranges
Parcels 100Q and 101Q
Fort McClellan, Alabama

Legend

- Area of Investigation
- EBS Range Fan Former Rifle/ Machine Gun Range Parcel 100Q
- EBS Range Fan Former Rifle/ Machine Gun Range Parcel 101Q

200 0 200 Feet

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much as 3 inches in diameter can be found through out this soil. Infiltration of this soil type is medium, permeability moderate, and the capacity for available moisture is high (USDA, 1961).

The Anniston gravelly clay loam consist of friable, medium to strongly acidic, deep, well-drained soils that have developed in old local alluvium on the foot slopes and along the base of larger hills in the region. The parent material for the Anniston gravelly clay loam is washed from the adjacent, higher-lying Linker, Muskingum, Enders, and Montevallo soils, which developed from weathered sandstone, shale, and quartzite. Sandstone and quartzite gravel, cobbles, and fragments as much as 8 inches in diameter are on the surface and throughout the soil. The color of the Anniston gravelly clay loam surface soil ranges from dark brown and very dark brown to reddish brown and dark reddish brown. The texture of subsoil ranges from light clay loam to clay or silty clay loam. The alluvium ranges in thickness from 2 feet to more than 8 feet. Infiltration and runoff are medium, permeability is moderate, and the capacity for available moisture is high. Organic matter is moderately low (USDA, 1961).

The Anniston and Allen gravelly loams consist of friable soils that have developed in old alluvium on foot slopes and fans along the base of larger hills in the region. The color of the surface soil ranges from very dark grayish brown to dark reddish brown. The sub-soil ranges from dark red to yellowish red. The texture of the subsoil ranges from light clay loam to clay or silty clay loam. The amount of gravel ranges from a few pieces to a significant quantity. Infiltration and runoff are medium, permeability is moderate and the capacity for available moisture is high (USDA, 1961).

1.3 Scope of Work

The scope of work for SI activities at Former Machine Gun/Rifle Ranges, Parcels 100Q and 101Q, as specified by the statement of work (USACE, 1999b), includes the following tasks:

- Develop the SFSP attachment.
- Develop the SSHP attachment.
- Conduct a surface and near-surface UXO survey over all areas to be included in the sampling effort.
- Provide downhole UXO support for all intrusive drilling to determine buried downhole hazards.

- Collect 21 surface soil samples, 21 subsurface soil samples, 3 groundwater samples, 3 surface water samples, and 3 sediment samples to determine whether potential site-specific chemicals (PSSC) are present within the area of investigation and to provide data useful for supporting any future planned corrective measures and closure activities.

- Analyze samples for the parameters listed in Section 4.5.

The Former Rifle/Machine Gun Ranges, Parcels 100Q and 101Q, fall within the "Possible Ordnance Impact Areas" shown on Plate 10 of the *Archives Search Report, Maps, Fort McClellan, Anniston, Alabama* (USACE, 1999a). Therefore, UXO surface sweeps and downhole surveys of soil borings will be required to support field activities at this site. The surface sweeps and downhole surveys will be conducted to identify anomalies for the purposes of UXO avoidance. The site-specific UXO safety plan will be used to support sample collection activities at the site should incidental ordnance, explosive, or UXO be encountered and require avoidance.

At completion of the field activities and sample analyses, an SI report will be prepared to summarize the results of the activities, to evaluate the absence or presence of PSSCs, and to recommend further actions, if appropriate. The SI report will be prepared in accordance with current U.S. Environmental Protection Agency (EPA), Region IV, and the Alabama Department of Environmental Management (ADEM) guidelines.

2.0 Summary of Existing Environmental Studies

2.1 Environmental Baseline Survey

The EBS was conducted by ESE to document current environmental conditions of all FTMC property (ESE, 1998). The study was to identify sites that, based on available information, have no history of contamination and comply with U.S. Department of Defense guidance for fast-track cleanup at closing installations. The EBS also provides a baseline picture of FTMC properties by identifying and categorizing the properties by the following seven criteria:

1. Areas where no storage, release, or disposal of hazardous substance or petroleum products has occurred (including no migration of these substances from adjacent areas)

2. Areas where only release or disposal of petroleum products has occurred

3. Areas where release, disposal, and/or migration of hazardous substance has occurred, but at concentrations that do not require a removal or remedial response

4. Areas where release, disposal, and/or migration of hazardous substance has occurred, and all removal or remedial actions to protect human health and the environment have been taken

5. Areas where release, disposal, and/or migration of hazardous substance has occurred, and removal or remedial actions are underway, but all required remedial actions have not yet been taken

6. Areas where release, disposal, and/or migration of hazardous substance has occurred, but required actions have not yet been implemented

7. Areas that are not evaluated or require further evaluation.

For non-Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) environmental or safety issues, the parcel label includes the following components: a unique non-CERCLA issue number, the letter "Q" designating the parcel as a Community Environmental Response Facilitation Act (CERFA) Category 1 Qualified Parcel, and the code for the specific non-CERCLA issue(s) present (ESE, 1998). The non-CERCLA issue codes used are:

- A = Asbestos (in buildings)
- L = Lead-based paint (in buildings)
- P = Polychlorinated biphenyls
- R = Radon (in buildings)

- RD = Radionuclides/radiological issues
- X = UXO
- CWM = Chemical warfare material.

The EBS was conducted in accordance with the CERFA (CERFA-Public Law 102-426) protocols and U.S. Department of Defense policy regarding contamination assessment. Record searches and reviews were performed on all reasonably available documents from FTMC, ADEM, EPA Region IV, and Calhoun County, as well as a database search of CERCLA-regulated substances, petroleum products, and Resource Conservation and Recovery Act-regulated facilities. Available historical maps and aerial photographs were reviewed to document historical land uses. Personal and telephone interviews of past and present FTMC employees and military personnel were conducted. In addition, visual site inspections were conducted to verify conditions of specific property parcels.

Former Rifle/Machine Gun Ranges, Parcels 100Q and 101Q, were identified as Category 1 CERFA sites, parcels where no known or recorded storage, release, or disposal (including migration) has occurred on site property; but the categorization of the ranges is qualified because the sites were active ranges. Former Rifle/Machine Gun Ranges, Parcels 100Q and 101Q, require additional evaluation to determine the environmental condition of the parcels.

3.0 Site-Specific Data Quality Objectives

3.1 Overview

The data quality objective (DQO) process is followed to establish data requirements. This process ensures that the proper quantity and quality of data are generated to support the decision-making process associated with the action selection for Former Rifle/Machine Gun Ranges, Parcels 100Q and 101Q. This section incorporates the components of the DQO process described in the publication EPA 540-R-93-071 *Data Quality Objectives Process for Superfund* (EPA, 1993). The DQO process as applied to the Former Rifle/Machine Gun Ranges, Parcels 100Q and 101Q, is described in more detail in Section 4.3 of the WP. Table 3-1 provides a summary of the factors used to determine the appropriate quantity of samples and the procedures necessary to meet the objectives of the SI and establish a basis for future action at this site.

The samples will be analyzed using EPA SW-846 methods, including Update III Methods where applicable, as presented in Chapter 4.0 of this SFSP and Table 6-1 in the QAP. Data will be reported and evaluated in accordance with Corps of Engineers South Atlantic Savannah (CESAS) Level B criteria (USACE, 1994) and the stipulated requirements for the generation of definitive data (Section 3.1.2 of the QAP). Chemical data will be reported via hard-copy data packages by the laboratory using Contract Laboratory Program-like forms along with electronic copies. These packages will be validated in accordance with EPA National Functional Guidelines by Level III criteria.

3.2 Data Users and Available Data

The available data, presented in Table 3-1, related to the SI at the Former Rifle/Machine Gun Ranges, Parcels 100Q and 101Q, have been used to formulate a site-specific conceptual model. This conceptual model was developed to support the development of this SFSP, which is necessary to meet the objectives of these activities and to establish a basis for future action at the site. The users of the data and information generated during field activities are primarily EPA, USACE, ADEM, FTMC, and the USACE supporting contractors. This SFSP, along with the necessary companion documents, has been designed to provide the regulatory agencies with sufficient detail to reach a determination as to the adequacy of the scope of work. The program has also been designed to provide the level of defensible data and information required to confirm or rule out the existence of residual chemical contamination in site media.

Table 3-1

Summary of Data Quality Objectives
Former Rifle/Machine Gun Ranges
Parcels 100Q and 101Q
Site Investigation
Fort McClellan, Calhoun County, Alabama

Users	Available Data	Conceptual Site Model	Media of Concern	Data Uses and Objectives	Data Types	Analytical Level	Data Quantity
EPA, ADEM USACE, DOD FTMC, IT Corporation Other contractors, and possible future land users	None	Contaminant Source Former Rifle/Machine Gun Ranges Parcels 100Q, and 101Q (explosives and lead) Migration Pathways Infiltration to subsurface soil, infiltration and leaching to groundwater, biotransfer to venison, dust emissions and volatilization to ambient air, groundwater discharge to surface water, and runoff and erosion to surface water and sediment Potential Receptors Residents (future), Recreational site user (current) Groundskeeper (future) Construction Worker (future) PSSC metals, nitroexplosives	Surface soil Subsurface Soil Groundwater Surface Water Sediment	SI to confirm the presence or absence of contamination in the site media Definitive quality data for future decision-making	Surface soil All Samples TAL Metals and Nitroexplosives 10% VOCs, SVOCs, Chlorinated Pesticides, Chlorinated herbicides, Organophosphate Pesticides	Definitive data in data packages (as defined in USACE EM200-1-6)	21 direct-push surface soil samples + QC
					Subsurface Soil All Samples TAL Metals and Nitroexplosives 10% VOCs, SVOCs, Chlorinated Pesticides, Chlorinated herbicides, Organophosphate Pesticides	Definitive data in data packages (as defined in USACE EM200-1-6)	21 direct-push subsurface soil samples + QC
					Groundwater All Samples TAL Metals and Nitroexplosives 10% VOCs, SVOCs, Chlorinated Pesticides, Chlorinated herbicides, Organophosphate Pesticides	Definitive data in data packages (as defined in USACE EM200-1-6)	3 groundwater samples + QC
					Surface Water All Samples TAL Metals and Nitroexplosives 10% VOCs, SVOCs, Chlorinated Pesticides, Chlorinated herbicides, Organophosphate Pesticides	Definitive data in data packages (as defined in USACE EM200-1-6)	3 surface water samples + QC
					Sediment All Samples TAL Metals and Nitroexplosives, TOC and Grain Size 10% VOCs, SVOCs, Chlorinated Pesticides, Chlorinated herbicides, Organophosphate Pesticides	Definitive data in data packages (as defined in USACE EM200-1-6)	3 sediment samples + QC

ADEM - Alabama Department of Environmental Management.
CESAS - Corps of Engineers South Atlantic Savannah.
DOD - U.S. Department of Defense.
EPA - U.S. Environmental Protection Agency.
FTMC - Fort McClellan.
USACE - U.S. Army Corps of Engineers.
VOC - Volatile organic compound.
SVOC - Semivolatile organic compound.
SI - Site investigation.
QC - Quality control.
TAL - Target analyte list.
TOC - Total organic carbon.
PSSC - Potential site-specific chemical.
EM200-1-6 - USACE Engineering Manual, *Chemical Quality Assurance for HTRW Projects*, October 10, 1997.

3.3 Conceptual Site Exposure Model

The conceptual site exposure model (CSEM) provides the basis for identifying and evaluating potential risks and hazards to human health in the risk assessment. The CSEM includes receptors and potential exposure pathways appropriate to all plausible scenarios. The CSEM facilitates a consistent and comprehensive evaluation of risk to human health through graphically presenting all possible exposure pathways, including sources, release and transport pathways, and exposure routes. In addition, the CSEM helps to ensure that potential pathways are not overlooked. The elements of a complete exposure pathway and CSEM are:

- Source (i.e., contaminated environmental) media
- Contaminant release mechanisms
- Contaminant transport pathways
- Receptors
- Exposure pathways.

Contaminant release mechanisms and transport pathways are not relevant for scenarios involving direct receptor contact with a contaminated source medium.

Primary contaminant releases were probably limited to training activities - more precisely, pieces of ammunition deposited on or within surface and subsurface soil and their subsequent breakdown. Potential contaminant transport pathways include infiltration and leaching to subsurface soil and groundwater, biotransfer to deer through browsing, dust emissions and volatilization to ambient air, groundwater discharge to surface water, surface water runoff, and erosion to surface water and sediment.

Data collected previously from parcels that overlap will be incorporated into the present SI screened against the applicable receptor-specific site-specific screening levels.

Currently the ranges are not used and are not maintained. Trees and grass vegetate most of the study area. The ranges are not fenced; therefore, people may trespass at the sites for hunting. There is not sufficient surface water to support fish habitat for fish consumption. The only plausible receptor under the current land-use scenario is a recreational site user who may hunt. Other potential receptors considered, but not included under the current land-use scenario, are the:

- ***Groundskeeper.*** The ranges are not currently maintained and will not be maintained in the future.

- ***Construction Worker.*** The site is unused, and no development or construction is occurring or scheduled.

- ***Resident.*** The site is not currently used for residential purposes.

Future land use in this area is shown as industrial (FTMC, 1997). The sites may not be deemed safe for public access until remediation has been completed because of the potential for UXO (FTMC, 1997). Plausible future land-use receptor scenarios addressed in the CSEM include:

- ***Resident.*** Although the site is not planned for residential use, the residential scenario is considered in order to provide information for the project manager and regulators.

- ***Groundskeeper.*** The portions of the ranges developed for industrial use will require maintenance; also, this receptor scenario represents the most highly exposed site worker for an industrial scenario.

- ***Construction Worker.*** The site may be developed for industrial use in the future.

A summary of relevant contaminant release and transport mechanisms, source and exposure media, and receptors and exposure pathways for this site is provided in Table 3-1 and Figure 3-1.

3.4 Decision-Making Process, Data Uses, and Needs

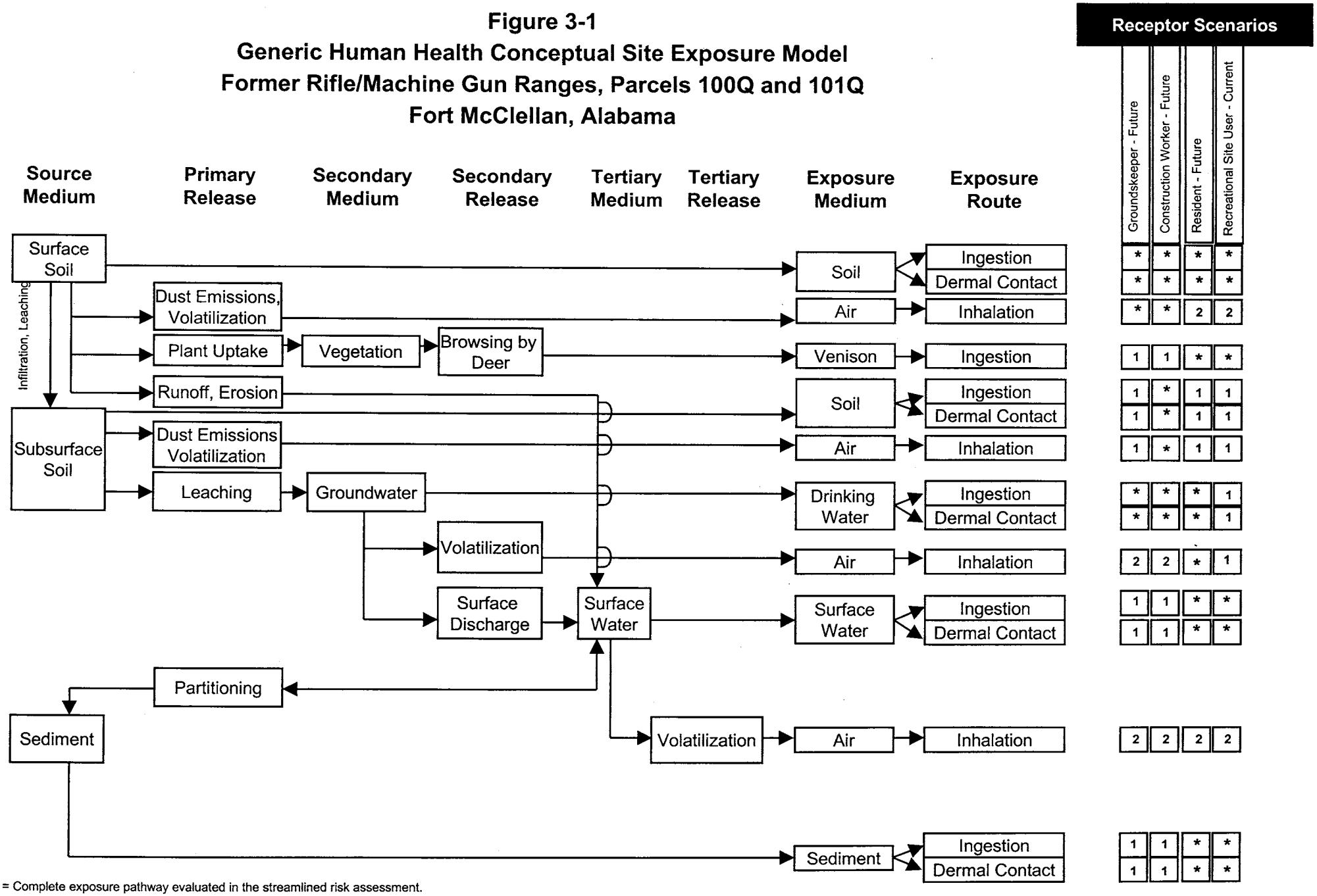
The decision-making process is a seven-step process that is presented in detail in Section 4.3 of the WP and will be followed during the SI at the Former Rifle/Machine Gun Ranges, Parcels 100Q and 101Q. Data uses and needs are summarized in Table 3-1.

3.4.1 Risk Evaluation

Results from these analyses will be compared with site-specific screening levels, ecological screening values and background values to determine if potential site-specific chemicals are present at the site at concentrations that pose an unacceptable risk to human health or the environment. EPA definitive data with CESAS Level B data packages will be used to determine whether or not PSSCs are detected in site media. Definitive data will be adequate for confirming the presence of site contamination and for supporting a feasibility study and risk assessment.

Assessment of potential ecological risk associated with sites or parcels (e.g., surface water and sediment sampling, specific ecological assessment methods) will be addressed in accordance with the procedures in the WP.

Figure 3-1
Generic Human Health Conceptual Site Exposure Model
Former Rifle/Machine Gun Ranges, Parcels 100Q and 101Q
Fort McClellan, Alabama



* = Complete exposure pathway evaluated in the streamlined risk assessment.
1 = Incomplete exposure pathway.
2 = Although theoretically complete, this pathway is judged to be insignificant and is not evaluated in the streamlined risk assessment.

3.4.2 Data Types and Quality

Surface soil, subsurface soil, groundwater, surface water, and sediment will be sampled and analyzed to meet the objectives of the SI at the Former Rifle/Machine Gun Ranges, Parcels 100Q and 101Q. Quality assurance/quality control (QA/QC) samples will be collected for all sample types as described in Chapter 4.0 of this SFSP. Samples will be analyzed by EPA-approved SW-846 Methods Update III, where available; comply with EPA definitive data requirements; and be reported using hard-copy data packages. In addition to meeting the quality needs of this SI, data analyzed at this level of quality are appropriate for all phases of site characterization, remedial investigation, and risk assessment.

3.4.3 Precision, Accuracy, and Completeness

Laboratory requirements of precision, accuracy, and completeness for this SI are provided in Section 9.0 of the QAP.

4.0 Field Activities

4.1 UXO Survey Requirements and Utility Clearances

The Former Rifle/Machine Gun Ranges, Parcels 100Q and 101Q, fall within the "Possible Ordnance Impact Area" shown on Plate 10 of the *Archives Search Report, Maps, Fort McClellan, Anniston, Alabama* (USACE, 1999a). Therefore, IT will conduct UXO avoidance activities, including surface sweeps and downhole surveys of soil borings. The site-specific UXO safety work plan provides technical guidance for ordnance and explosives avoidance for sample collection activities at the Former Rifle/Machine Gun Ranges, Parcels 100Q and 101Q. The site-specific UXO safety work plan attachment has been written in conjunction with Appendix E of the SAP (IT, 2000a).

4.1.1 Surface UXO Survey

A UXO sweep will be conducted over areas that will be included in the sampling and surveying activities to identify UXO on or near the surface that may present a hazard to on-site workers during field activities. Low-sensitivity magnetometers will be used to locate surface and shallow-buried metal objects. UXO located on the surface will be identified and conspicuously marked for easy avoidance. Subsurface metallic anomalies will not be disturbed but will also be marked for easy avoidance. UXO personnel requirements, procedures, and detailed descriptions of the geophysical equipment to be used are provided in Chapter 4.0 and Appendices D and E of the approved SAP (IT, 2000a).

4.1.2 Downhole UXO Survey

During the soil boring and downhole sampling, downhole UXO surveys will be performed to determine if buried metallic objects are present. UXO monitoring, as described in Chapter 4.0 of the SAP (IT, 2000a), will continue until undisturbed soils are encountered or the borehole has been advanced to 12 feet bgs, whichever is reached first.

4.1.3 Utility Clearances

After the UXO surface survey has cleared the area to be sampled and prior to performing any intrusive sampling, a utility clearance will be performed at locations where soil and groundwater samples will be collected, using the procedure outlined in Section 4.2.6 of the SAP (IT, 2000a). The site manager will mark the proposed locations with stakes, coordinate with the local utility companies to clear the proposed locations for utilities, and obtain digging permits. Once the

locations are approved (for both UXO and utility avoidance) for intrusive sampling, the stakes will be labeled as cleared.

4.2 Environmental Sampling

The environmental sampling program at the Former Rifle/Machine Gun Ranges, Parcels 100Q and 101Q, includes the collection of surface soil, subsurface soil, groundwater, surface water, and sediment samples for chemical analyses. These samples will be collected and analyzed to provide data for characterizing the site to determine the environmental condition of the site and any further action to be conducted at the site. Additionally, samples will be collected from environmental media in locations that will assist in the assessment of potential ecological impacts resulting from activities at the site.

4.2.1 Surface Soil Sampling

Surface soil samples will be collected from 21 locations at Former Rifle/Machine Gun Ranges, Parcels 100Q and 101Q.

4.2.1.1 Sample Locations and Rationales

The surface soil sampling rationales are listed in Table 4-1. Proposed sampling locations are shown in Figure 4-1. Surface soil sample designations and QA/QC sample requirements are summarized in Table 4-2. The final soil sampling locations will be determined in the field by the on-site geologist, based on actual field conditions.

4.2.1.2 Sample Collection

Surface soil samples will be collected from the upper 1 foot of soil by direct-push methodology or 3-inch diameter stainless-steel hand auger using the methods as specified in Section 4.7.1.1 and Section 4.9 of the SAP (IT, 2000a), respectively. Collected soil samples will be screened using a photoionization detector (PID) in accordance with Section 4.15 of the SAP. Surface soil samples will be screened for information purposes only and not to select samples for analysis. Sample containers, sample volumes, preservatives, and holding times for the analyses required in this SFSP are listed in Section 5.0, Table 5-1, of the QAP. Sample documentation and chain-of-custody (COC) will be recorded as specified in Section 4.13 of the SAP. The samples will be analyzed for the parameters listed in Section 4.5 of this SFSP.

Table 4-1

Sampling Locations and Rationale
Former Rifle/Machine Gun Range
Parcels 100Q, and 101Q
Fort McClellan, Calhoun County, Alabama

Parcel Number	Sample Location	Sample Media	Sample Location Rationale
100Q	HR-100Q-MW01	Surface soil, subsurface soil, and groundwater	Soil boring for surface soil, subsurface soil, and groundwater samples to be collected from the northcenteral portion of the area of investigation between the firing lines for Parcel 100Q and 101Q. This sample location was selected because it is within a historically disturbed area and its down gradient of several historic berm locations that were identified during the review of aerial photographs. Sample data will indicate if contaminant releases into the environment have occurred from former activities at this area of the site and if contaminated soil exists at this location. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes. The monitoring well location will be used to establish a local groundwater flow direction and site-specific geology, and provide information on groundwater quality in the residuum aquifer.
	HR-100Q-MW02	Surface soil, subsurface soil, and groundwater	Soil boring for surface soil, subsurface soil, and groundwater samples to be collected from the centeral portion of the area of investigation south of the firing line for Parcel 100Q. This sample location was selected because it is within a portion of the area of invetigation containing historic berm locations and six cleared areas suggestive of bullet channels. These features were identified during the review of aerial photographs. Sample data will indicate if contaminant releases into the environment have occurred from former activities at this area of the site and if contaminated soil exists at this location. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes. The monitoring well location will be used to establish a local groundwater flow direction and site-specific geology, and provide information on groundwater quality in the residuum aquifer.
	HR-100Q-GP01	Surface soil and subsurface soil	Soil boring for surface soil and subsurface soil samples to be collected in the northern portion of the area of investigation within the firing line for Parcel 100Q. This sample location was selected because review of aerial photographs showed historically the area to be heavily used with a significant amount of disturbance. Sample data will indicate if contaminant releases into the environment have occurred from former activities at this area of the site and if contaminated soil exists at this location. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
	HR-100Q-GP02	Surface soil and subsurface soil	Soil boring for surface soil and subsurface soil samples to be collected in the northeastern portion of the area of investigation within the firing line for Parcel 100Q. This sample location was selected because review of aerial photographs showed historically the area to be heavily used with a significant amount of disturbance. Sample data will indicate if contaminant releases into the environment have occurred from former activities at this area of the site and if contaminated soil exists at this location. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.

Table 4-1

Sampling Locations and Rationale
Former Rifle/Machine Gun Range
Parcels 100Q, and 101Q
Fort McClellan, Calhoun County, Alabama

Parcel Number	Sample Location	Sample Media	Sample Location Rationale
100Q	HR-100Q-GP03	Surface soil and subsurface soil	Soil boring for surface soil and subsurface soil samples to be collected in the northern portion of the area of investigation along the southern boundry of the firing line for Parcel 100Q. This sample location was selected because review of aerial photographs showed historically the area to be heavily used with a significant amount of disturbance. Sample data will indicate if contaminant releases into the environment have occurred from former activities at this area of the site and if contaminated soil exists at this location. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
	HR-100Q-GP04	Surface soil and subsurface soil	Soil boring for surface soil and subsurface soil samples to be collected in the east central portion of the area of investigation. This sample location to be within a historic berm location. Sample data will indicate if contaminant releases into the environment have occurred from former activities at this area of the site and if contaminated soil exists at this location. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
	HR-100Q-GP05	Surface soil and subsurface soil	Soil boring for surface soil and subsurface soil samples to be collected in the north-centeral portion of the area of investigation. This sample location was selected because review of aerial photographs showed the sample location to be within one of six historic cleared areas suggestive of bullet channels and a historic berm location. Sample data will indicate if contaminant releases into the environment have occurred from former activities at this area of the site and if contaminated soil exists at this location. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
	HR-100Q-GP06	Surface soil and subsurface soil	Soil boring for surface soil and subsurface soil samples to be collected in the central portion of the area of investigation. This sample location was selected because review of aerial photographs showed the sample location to be within one of six historic cleared areas suggestive of bullet channels and a historic berm location. Sample data will indicate if contaminant releases into the environment have occurred from former activities at this area of the site and if contaminated soil exists at this location. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.

Table 4-1

Sampling Locations and Rationale
Former Rifle/Machine Gun Range
Parcels 100Q, and 101Q
Fort McClellan, Calhoun County, Alabama

Parcel Number	Sample Location	Sample Media	Sample Location Rationale
100Q	HR-100Q-GP07	Surface soil and subsurface soil	Soil boring for surface soil and subsurface soil samples to be collected in the north-central portion of the area of investigation. This sample location was selected because review of aerial photographs showed the sample location to be in the center portion of an area that contains six historic cleared areas suggestive of bullet channels. Sample data will indicate if contaminant releases into the environment have occurred from former activities at this area of the site and if contaminated soil exists at this location. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
	HR-100Q-GP08	Surface soil and subsurface soil	Soil boring for surface soil and subsurface soil samples to be collected in the north-central portion of the area of investigation. This sample location was selected because review of aerial photographs showed the sample location to be within one of six historic cleared areas suggestive of bullet channels. Sample data will indicate if contaminant releases into the environment have occurred from former activities at this area of the site and if contaminated soil exists at this location. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
	HR-100Q-GP09	Surface soil and subsurface soil	Soil boring for surface soil and subsurface soil samples to be collected in the central portion of the area of investigation. This sample location was selected because review of aerial photographs showed the sample location to be within one of six historic cleared areas suggestive of bullet channels and a historic berm location. Sample data will indicate if contaminant releases into the environment have occurred from former activities at this area of the site and if contaminated soil exists at this location. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
	HR-100Q-GP10	Surface soil and subsurface soil	Soil boring for surface soil and subsurface soil samples to be collected in the east-central portion of the area of investigation. This sample location was selected because review of aerial photographs showed the sample location to be in the center portion of an area that contains six historic cleared areas suggestive of bullet channels. Sample data will indicate if contaminant releases into the environment have occurred from former activities at this area of the site and if contaminated soil exists at this location. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.

Table 4-1

Sampling Locations and Rationale
Former Rifle/Machine Gun Range
Parcels 100Q, and 101Q
Fort McClellan, Calhoun County, Alabama

Parcel Number	Sample Location	Sample Media	Sample Location Rationale
	HR-100Q-GP11	Surface soil and subsurface soil	Soil boring for surface soil and subsurface soil samples to be collected in the eastern portion of the area of investigation. This sample location was selected because review of aerial photographs showed the sample location to be within one of six historic cleared areas suggestive of bullet channels. Sample data will indicate if contaminant releases into the environment have occurred from former activities at this area of the site and if contaminated soil exists at this location. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
100Q	HR-100Q-GP12	Surface soil and subsurface soil	Soil boring for surface soil and subsurface soil samples to be collected in the eastern portion of the area of investigation. This sample location was selected because review of aerial photographs showed the sample location to be within one of six historic cleared areas suggestive of bullet channels. Sample data will indicate if contaminant releases into the environment have occurred from former activities at this area of the site and if contaminated soil exists at this location. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
	HR-100Q-GP13	Surface soil and subsurface soil	Soil boring for surface soil and subsurface soil samples to be collected in the central portion of the area of investigation. This sample location was selected because review of aerial photographs showed historically a significant amount of disturbance. Sample data will indicate if contaminant releases into the environment have occurred from former activities at this area of the site and if contaminated soil exists at this location. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
	HR-100Q-GP14	Surface soil and subsurface soil	Soil boring for surface soil and subsurface soil samples to be collected in the eastern portion of the area of investigation. This sample location was selected because review of aerial photographs showed historically a significant amount of disturbance. Sample data will indicate if contaminant releases into the environment have occurred from former activities at this area of the site and if contaminated soil exists at this location. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
	HR-100Q-GP15	Surface soil and subsurface soil	Soil boring for surface soil and subsurface soil samples to be collected in the southeastern portion of the area of investigation. This sample location was selected because review of aerial photographs showed a significant amount of disturbance. Sample data will indicate if contaminant releases into the environment have occurred from former activities at this area of the site and if contaminated soil exists at this location. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.

Table 4-1

Sampling Locations and Rationale
Former Rifle/Machine Gun Range
Parcels 100Q, and 101Q
Fort McClellan, Calhoun County, Alabama

Parcel Number	Sample Location	Sample Media	Sample Location Rationale
	HR-100Q-SW/SD01	Surface Water and Sediment	The surface water and sediment sample will be collected upstream of the area of investigation from an intermittent stream which flows through the northeast protion of the area of investigation. Sample data will indicate if contaminant releases have occurred from runoff upstream of area of investigation from former activities in this area. Sample data will also be used to assess potential impacts to aquatic biota in the waterway and other ecological receptors that may utilize the waterway for food and/or habitat purposes.
100Q	HR-100Q-SW/SD02	Surface Water and Sediment	The surface water and sediment samples will be collected downstream of the area of investigation just north of the firinig line for Parcel 100Q from an intermittent stream that flows through the northeastern portion of the area of investigation. Sample data will indicate if contaminant releases have occurred from runoff from former activities in this area. Sample data will also be used to assess potential impacts to aquatic biota in the waterway and other ecological receptors that may utilize the waterway for food and/or habitat purposes.
	HR-100Q-SW/SD03	Surface Water and Sediment	The surface water and sediment samples will be collected from a surface water drainage feature found along the north and eastern boundary of the area of investigation just within the eastern boundry of the firing line for Parcel 100Q. Sample data will indicate if contaminant releases have occurred from runoff upstream of area of investigation from former activities in this area. Sample data will also be used to assess potential impacts to aquatic biota in the waterway and other ecological receptors that may utilize the waterway for food and/or habitat purposes.
101Q	HR-101Q-MW01	Surface soil, subsurface soil, and groundwater	Soil boring for surface soil, subsurface soil, and groundwater samples to be collected from the southern portion of the area of investigation just south of Parcel's 101Q range fan. This sample location was selected because it is within a historic berm location, which overlaps with an historically disturbed area. Both features were identified during the review of aerial photographs. Sample data will indicate if contaminant releases into the environment have occurred from former activities at this area of the site and if contaminated soil exists at this location. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes. The monitoring well location will be used to establish a local groundwater flow direction and site-specific geology, and provide information on groundwater quality in the residuum aquifer.
	HR-101Q-GP01	Surface soil and subsurface soil	Soil boring for surface soil and subsurface soil samples to be collected in area with mounds identified during the site walk by IT personnel located in the northern portion of the area of investigation within the firing line for Parcel 101Q. Sample data will indicate if contaminant releases into the environment have occurred from former activities at this area of the site and if contaminated soil exists at this location. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.

Table 4-1

Sampling Locations and Rationale
Former Rifle/Machine Gun Range
Parcels 100Q, and 101Q
Fort McClellan, Calhoun County, Alabama

Parcel Number	Sample Location	Sample Media	Sample Location Rationale
	HR-101Q-GP02	Surface soil and subsurface soil	Soil boring for surface soil and subsurface soil samples to be collected in the central portion of the area of investigation. This sample location was selected because review of aerial photographs showed the location to be a historic berm location. Sample data will indicate if contaminant releases into the environment have occurred from former activities at this area of the site and if contaminated soil exists at this location. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
101Q	HR-101Q-GP03	Surface soil and subsurface soil	Soil boring for surface soil and subsurface soil samples to be collected in the southern portion of the area of investigation with in the range fan for Parcel 101Q. This sample location was selected because review of aerial photographs showed historically a significant amount of disturbance. Sample data will indicate if contaminant releases into the environment have occurred from former activities at this area of the site and if contaminated soil exists at this location. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.

DWG. NO.: ...\796887es.231 | PROJ. NO.: 796887
INITIATOR: J. REMO | PROJ. MGR.: J. YACOUB
DRAFT. CHCK. BY: | ENGR. CHCK. BY: S. MORAN
DATE LAST REV.: | DRAWN BY:
STARTING DATE: 11/05/01 | DRAWN BY: D. BOMAR
01/23/02 10:45:50 AM
DBILLING
c:\cadd\design\796887es.231

E 674,700

E 676,700

N 1,181,400

N 1,180,000

FLOW DIRECTION

GOBBLER ROAD

FALCON ROAD

PARCEL 100Q

PARCEL 101Q

HR-100Q-SW/SD03

HR-100Q-GP02

HR-100Q-SW/SD02

HR-100Q-GP01

HR-100Q-GP11

HR-100Q-GP08

HR-100Q-SW/SD01

HR-100Q-GP03

HR-100Q-MW02

HR-100Q-GP10

HR-100Q-GP05

HR-100Q-GP07

HR-100Q-GP12

HR-100Q-MW01

HR-100Q-GP09

HR-100Q-GP14

HR-101Q-GP01

HR-100Q-GP04

HR-100Q-GP06

HR-100Q-GP13

HR-100Q-GP15

HR-101Q-GP02

HR-101Q-MW01

HR-101Q-GP03

750

775

800

825

LEGEND

- UNIMPROVED ROADS AND PARKING
- PAVED ROADS AND PARKING
- TOPOGRAPHIC CONTOURS (CONTOUR INTERVAL - 5 FOOT)
- TREES / TREELINE
- MARSH / WETLANDS
- AREA OF INVESTIGATION
- FIRING LINES
- SURFACE DRAINAGE / CREEK
- FENCE
- UTILITY POLE
- PROPOSED SURFACE WATER/SEDIMENT SAMPLE LOCATION
- PROPOSED SURFACE AND SUBSURFACE SOIL SAMPLE LOCATION
- PROPOSED GROUNDWATER, SURFACE AND SUBSURFACE SOIL SAMPLE LOCATION

TRAINING AIDS/PHYSICAL FEATURES OBSERVED

① MOUNDS IDENTIFIED DURING SITE WALK

② BERM IDENTIFIED ON AERIAL PHOTOGRAPHS

③ DISTURBED AREA IDENTIFIED ON AERIAL PHOTOGRAPHS

SCALE

0 200 400 FEET

FIGURE 4-1
PROPOSED SAMPLE LOCATION MAP FORMER RIFLE/MACHINE GUN RANGES PARCELS 100Q AND 101Q

U. S. ARMY CORPS OF ENGINEERS
MOBILE DISTRICT
FORT McCLELLAN
CALHOUN COUNTY, ALABAMA
Contract No. DACA21-96-D-0018

IT CORPORATION
A Member of The IT Group

Table 4-2

Surface Soil and Subsurface Soil Sample Designations and QA/QC Sample Quantities
Former Rifle/Machine Gun Ranges, Parcels 100Q, and 101Q
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Designation	Sample Depth (ft)	QA/QC Samples			Analytical Suite
			Field Duplicates	Field Splits	MS/MSD	
HR-100Q-GP01	HR-100Q-GP01-SS-PY0001-REG	0-1				TAL Metals and Nitroexplosives
	HR-100Q-GP01-DS-PY0002-REG	2-4[a]				
HR-100Q-GP02	HR-100Q-GP02-SS-PY0003-REG	0-1				TAL Metals and Nitroexplosives
	HR-100Q-GP02-DS-PY0004-REG	2-4[a]	HR-100Q-GP02-DS-PY0005-FD			
HR-100Q-GP03	HR-100Q-GP03-SS-PY0006-REG	0-1				TAL Metals and Nitroexplosives
	HR-100Q-GP03-DS-PY0007-REG	2-4[a]				
HR-100Q-GP04	HR-100Q-GP04-SS-PY0008-REG	0-1				TAL Metals, Nitrexplosives Explosives VOCs, SVOCs, CL Pesticides, OP Pesticides, and CL Herbicides
	HR-100Q-GP04-DS-PY0009-REG	2-4[a]				
HR-100Q-GP05	HR-100Q-GP05-SS-PY0010-REG	0-1			HR-100Q-GP05-SS-PY0010-MS/MSD	TAL Metals and Nitroexplosives
	HR-100Q-GP05-DS-PY0011-REG	2-4[a]				
HR-100Q-GP06	HR-100Q-GP06-SS-PY0012-REG	0-1				TAL Metals and Nitroexplosives
	HR-100Q-GP06-DS-PY0013-REG	2-4[a]				
HR-100Q-GP07	HR-100Q-GP07-SS-PY0014-REG	0-1				TAL Metals and Nitroexplosives
	HR-100Q-GP07-DS-PY0015-REG	2-4[a]				
HR-100Q-GP08	HR-100Q-GP08-SS-PY0016-REG	0-1	HR-100Q-GP08-SS-PY0017-FD			TAL Metals, Nitrexplosives Explosives VOCs, SVOCs, CL Pesticides, OP Pesticides, and CL Herbicides
	HR-100Q-GP08-DS-PY0018-REG	2-4[a]				
HR-100Q-GP09	HR-100Q-GP09-SS-PY0019-REG	0-1				TAL Metals and Nitroexplosives
	HR-100Q-GP09-DS-PY0020-REG	2-4[a]				
HR-100Q-GP10	HR-100Q-GP10-SS-PY0021-REG	0-1				TAL Metals and Nitroexplosives
	HR-100Q-GP10-DS-PY0022-REG	2-4[a]				
HR-100Q-GP11	HR-100Q-GP11-SS-PY0023-REG	0-1				TAL Metals and Nitroexplosives
	HR-100Q-GP11-DS-PY0024-REG	2-4[a]				
HR-100Q-GP12	HR-100Q-GP12-SS-PY0025-REG	0-1				TAL Metals and Nitroexplosives
	HR-100Q-GP12-DS-PY0026-REG	2-4[a]				
HR-100Q-GP13	HR-100Q-GP13-SS-PY0027-REG	0-1				TAL Metals and Nitroexplosives
	HR-100Q-GP13-DS-PY0028-REG	2-4[a]				
HR-100Q-GP14	HR-100Q-GP14-SS-PY0029-REG	0-1				TAL Metals and Nitroexplosives
	HR-100Q-GP14-DS-PY0030-REG	2-4[a]				

Table 4-2

Surface Soil and Subsurface Soil Sample Designations and QA/QC Sample Quantities
Former Rifle/Machine Gun Ranges, Parcels 100Q, and 101Q
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Designation	Sample Depth (ft)	QA/QC Samples			Analytical Suite
			Field Duplicates	Field Splits	MS/MSD	
HR-100Q-GP15	HR-100Q-GP15-SS-PY0031-REG	0-1				TAL Metals and Nitroexplosives
	HR-100Q-GP15-DS-PY0032REG	2-4[a]				
HR-100Q-MW01	HR-100Q-MW01-SS-PY0033-REG	0-1			HR-100Q-MW01-SS-PY0033-MS/MSD	TAL Metals, Nitrexplosives Explosives VOCs, SVOCs, CL Pesticides, OP Pesticides, and CL Herbicides
	HR-100Q-MW01-DS-PY0034-REG	2-4[a]				
HR-100Q-MW02	HR-100Q-MW02-SS-PY0035-REG	0-1				TAL Metals, Nitrexplosives Explosives VOCs, SVOCs, CL Pesticides, OP Pesticides, and CL Herbicides
	HR-100Q-MW02-DS-PY0036-REG	2-4[a]	HR-100Q-MW02-DS-PY0037-FD			
HR-101Q-GP01	HR-101Q-GP01-SS-PZ0001-REG	0-1				TAL Metals and Nitroexplosives
	HR-101Q-GP01-DS-PZ0002-REG	2-4[a]				
HR-101Q-GP02	HR-101Q-GP02-SS-PZ0003-REG	0-1	HR-101Q-GP02-SS-PR0004-FD			TAL Metals and Nitroexplosives
	HR-101Q-GP02-DS-PZ0005-REG	2-4[a]				
HR-101Q-GP03	HR-101Q-GP03-SS-PZ0006-REG	0-1	HR-101Q-GP03-SS-PR0007-FD			TAL Metals and Nitroexplosives
	HR-101Q-GP03-DS-PZ0008-REG	2-4[a]				
HR-101Q-MW01	HR-100Q-MW01-SS-PZ0009-REG	0-1				TAL Metals, Nitrexplosives Explosives VOCs, SVOCs, CL Pesticides, OP Pesticides, and CL Herbicides
	HR-100Q-MW01-DS-PZ0010-REG	2-4[a]				

[a] Actual sample depth selected for analysis will be at the discretion of the site geologist and will be based on field observation.

FD - Field duplicate.
FS - Field split.
MS/MSD - Matrix spike/matrix spike duplicate.
VOC - Volatile Organic Compound
SVOC - Semivolatile Organic Compound
QA/QC - Quality assurance/quality control.
REG - Field sample.
TAL - Target analyte list.
CL- Chlorinated
OP - Organphosphate

4.2.2 Subsurface Soil Sampling

Subsurface soil samples will be collected from 21 borings to be installed at Former Rifle/Machine Gun Ranges, Parcels 100Q and 101Q.

4.2.2.1 Sample Locations and Rationales

Subsurface soil samples will be collected from the soil borings proposed on Figure 4-1. The subsurface soil sampling rationales are listed in Table 4-1. Subsurface soil samples to be collected are listed in Table 4-2. The final soil boring sampling locations will be determined in the field by the on-site geologist, based on actual field observations and UXO and utility clearance results.

4.2.2.2 Sample Collection

Subsurface soil samples will be collected from soil borings at a depth greater than 1 foot bgs in the unsaturated zone. The soil borings will be advanced and soil samples collected using the direct-push sampling procedures specified in Section 4.7.1.1 of the SAP (IT, 2000a). In areas where site access does not permit the use of a direct-push rig, the samples will be collected using a hand auger.

Soil samples will be collected continuously for the first four feet. A detailed lithologic log will be recorded by the on-site geologist for each borehole. At least one subsurface sample from each borehole will be selected for analysis. The collected subsurface soil samples will be field-screened using a PID in accordance with Section 4.15 of the SAP to measure samples exhibiting elevated readings exceeding background (readings in ambient air). Typically, the subsurface soil sample showing the highest reading (above background) will be selected and sent to the laboratory for analysis. If none of the samples indicate readings exceeding background using the PID, the deepest interval from the soil boring will be sampled and submitted to the laboratory for analysis. Subsurface soil samples may be selected for analysis from any depth interval if the on-site geologist suspects PSSCs at the interval. Site conditions such as lithology may also determine the actual sample depth interval submitted for analysis. The depth of the boring may extended beyond four feet bgs and more than one subsurface soil sample will be collected if field measurements and observations indicate a possible layer of PSSCs and/or additional sample data would provide insight to the existence of any PSSCs.

Sample documentation and COC will be recorded as specified in Section 4.13 of the SAP. Sample containers, sample volumes, preservatives, and holding times for the analyses required in

this SFSP are listed in Section 5.0, Table 5-1 of the QAP. The samples will be analyzed for the parameters listed in Section 4.5 of this SFSP.

4.2.3 Permanent Residuum Monitoring Wells

Three permanent residuum monitoring wells will be installed in the study area at the Former Rifle/Machine Gun Ranges, Parcels 100Q and 101Q.

The permanent residuum monitoring well locations are shown on Figure 4-1. The rationales for the monitoring well locations are presented in Table 4-1. The monitoring well boreholes will be drilled to the top of bedrock or until adequate groundwater is encountered to install a well with a 10 to 20 foot screen. Monitoring wells will be installed using a hollow-stem auger drill rig mounted on a truck or on an all-terrain vehicle.

The monitoring well casing will consist of new 2-inch inside diameter, Schedule 40, threaded, flush-joint polyvinyl chloride (PVC) pipe. Attached to the bottom of the well casing will be a section of new threaded, flush-joint, 0.010-inch continuous wrap PVC well screen, approximately 10 to 20 feet long. The well will be installed so the well screen straddles the water table. At the discretion of the IT site manager, a sump (composed of new, 2-inch inside diameter Schedule 40, threaded, flush-joint PVC) may be attached to the bottom of the well screen. After the casing and screen materials are lowered into the boring, a filter pack will be installed around the well screen. In wells installed to depths of 20 feet or less, the filter pack will be gravity filled. In wells installed to depths of 20 feet or more, the filter pack will be tremied into place. The filter pack will be installed from the bottom of the well to approximately five feet above the top of the well screen. The filter pack will consist of 20/40 silica sand. A fine sand (30/70 silica sand) approximately five feet thick may be placed above the filter pack. A bentonite seal, approximately five feet thick, will be placed above the filter pack (or fine sand, if used). The remaining annular space will be grouted with a bentonite-cement mixture, using approximately 7 to 8 gallons of water and approximately 5 pounds of bentonite per 94-pound bag of Type I or Type II Portland cement. The grout will be tremied into place from the top of the bentonite seal to ground surface.

Soil samples for lithology will be collected starting at five feet bgs and at five-foot intervals thereafter, to the total depth of the borehole. The samples will be collected for lithology using a 24-inch long, 2-inch or larger diameter, split-spoon sampler. The soil borings will be logged in accordance with American Standard for Testing and Materials Method D 2488 using the Unified

Soil Classification System. The soil samples will be screened in the field using a PID. The monitoring wells will be drilled, installed, and developed as specified in Section 4.8 and Appendix C of the SAP (IT, 2000a). The exact monitoring well locations will be determined in the field by the on-site geologist, based on actual field conditions. Monitoring wells will be allowed to equilibrate for 14 days after well development prior to collecting groundwater samples.

4.2.4 Groundwater Sampling

Groundwater samples will be collected from the three monitoring wells completed in the area of investigation for the Former Rifle/Machine Gun Ranges, Parcels 100Q and 101Q, as presented in Section 4.2.3.

4.2.4.1 Sample Locations and Rationales

Groundwater samples will be collected from the monitoring well locations shown on Figure 4-1. The groundwater sampling rationales are listed in Table 4-1. The groundwater sample designations, and QA/QC sample quantities are listed in Table 4-3.

4.2.4.2 Sample Collection

Prior to sampling each monitoring well, static water level will be measured to define the groundwater flow in the residuum aquifer. Water level measurements will be performed as outlined in Section 4.18 of the SAP (IT, 2000a). Groundwater samples will be collected in accordance with the procedures outlined in Section 4.9.1.4 of the SAP. Low-flow groundwater sampling methodology outlined in August 2000 letter report to the USACE (IT, 2000b) may be used as deemed necessary by the IT site manager.

Sample documentation and COC will be recorded as specified in Section 4.13 of the SAP. Sample containers, sample volumes, preservatives, and holding times for the analyses required in this SFSP are listed in Section 5.0, Table 5-1 of the QAP (IT, 2000a). The samples will be analyzed for the parameters listed in Section 4.5 of this SFSP.

4.2.5 Surface Water Sampling

Three surface water samples will be collected from the area of investigation for the Former Rifle/Machine Gun Ranges, Parcels 100Q and 101Q. Surface water samples will be collected from the surface water features/creeks as shown on Figure 4-1.

Table 4-3

Groundwater Sample Designations and QA/QC Sample Quantities
Former Rifle/Machine Gun Ranges, Parcels 100Q and 101Q
Fort McClellan, Calhoun County, Alabama
Fort McClellan, Alabama

Sample Location	Sample Designation	Sample Matrix [a]	QA/QC Samples			Analytical Suite
			Field Duplicates	Field Splits	MS/MSD	
HR-100Q-MW01	HR-100Q-MW01-GW-PY3001-REG	Groundwater			HR-100Q-MW01-GW-PY3001-MS/MSD	TAL Metals and Nitroexplosives
HR-100Q-MW02	HR-100Q-MW02-GW-PY3002-REG	Groundwater				TAL Metals and Nitroexplosives
HR-101Q-MW01	HR-101Q-MW01-GW-PZ3001-REG	Groundwater	HR-102Q-MW01-GW-QF3002-FD			TAL Metals, Nitrexplosives Explosives VOCs, SVOCs, CL Pesticides, OP Pesticides, and CL Herbicides

[a] Actual sample depth selected for analysis will be at the discretion of the site geologist and will be based on field observation.

FD - Field duplicate.
FS - Field split.
MS/MSD - Matrix spike/matrix spike duplicate.
VOC - Volatile Organic Compound
SVOC - Semivolatile Organic Compound
QA/QC - Quality assurance/quality control.
REG - Field sample.
TAL - Target analyte list.
CL- Chlorinated
OP - Organphosphate

4.2.5.1 Sample Locations and Rationales

The surface water sampling rationales are listed in Table 4-1. The surface water samples will be collected from the proposed locations on Figure 4-1. The surface water sample designations and QA/QC sample requirements are listed in Table 4-4. The exact sampling locations will be determined in the field by the ecological sampler, based on drainage pathways and actual field observations.

4.2.5.2 Sample Collection

The surface water samples will be collected in accordance with the procedures specified in Section 4.9.1.3 of the SAP (IT, 2000a). Sample documentation and COC will be recorded as specified in Section 4.13 of the SAP. Sample containers, sample volumes, preservatives, and holding times for the analyses required in this SFSP are listed in Section 5.0, Table 5-1, of the QAP. The samples will be analyzed for the parameters listed in Section 4.5 of this SFSP.

4.2.6 Sediment Sampling

Three sediment samples will be collected from the area of investigation for the Former Rifle/Machine Gun Ranges, Parcels 100Q and 101Q. These sediment samples will be collected at the same locations as the surface water samples described in Section 4.2.5.

4.2.6.1 Sample Locations and Rationales

The proposed locations for the sediment samples are shown in Figure 4-1. Sediment sampling rationales are presented in Table 4-1. The sediment sample designations and QA/QC sample requirements are listed in Table 4-4. The actual sediment sample points will be at the discretion of the ecological sampler, based on drainage pathways and actual field observations.

4.2.6.2 Sample Collection

The sediment samples will be collected in accordance with the procedures specified in Section 4.9.1.2 of the SAP. Sample documentation and COC will be recorded as specified in Section 4.13 of the SAP. The sediment samples will be analyzed for the parameters listed in Section 4.5 of this SFSP.

4.3 Decontamination Requirements

Decontamination will be performed on sampling and nonsampling equipment to prevent cross-contamination between sampling locations. Decontamination of sampling equipment will be performed in accordance with the requirements presented in Section 4.10.1.1 of the SAP (IT,

Table 4-4

Surace Water and Sediment Sample Designations and QA/QC Sample Quantities
Former Rifle Machine Gun Ranges, Parcels 100Q and 101Q
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Designation	Sample Matrix	Sample Depth (ft)	QA/QC Samples			Analytical Suite
				Field Duplicates	Field Splits	MS/MSD	
HR-100Q-SW/SD01	HR-100Q-SW/SD01-SW-PY2001-REG HR-100Q-SW/SD01-SD-PY1001-REG	Surface water sediment	a 0-0.5				TAL Metals and Nitroexplosives TOC, Grain Size (sediment only)
HR-100Q-SW/SD02	HR-100Q-SW/SD02-SW-PY2002-REG HR-100Q-SW/SD02-SD-PY1002-REG	Surface water sediment	a 0-0.5	HR-100Q-SW/SD02-SW-PY2003-FD HR-100Q-SW/SD02-SD-PY1003-FD			TAL Metals and Nitroexplosives TOC, Grain Size (sediment only)
HR-100Q-SW/SD03	HR-101Q-SW/SD03-SW-PY2004-REG HR-101Q-SW/SD03-SD-PY1004-REG	Surface water sediment	a 0-0.5			HR-100Q-SW/SD03-SW-PY2004-MS/MSD HR-100Q-SW/SD03-SD-PY1004-MS/MSD	TAL Metals and Nitroexplosives TOC, Grain Size (sediment only) VOCs, SVOCs, CL Pesticides, OP Pesticides, and CL Herbicides

[a] Sample depth will depend on where sufficient first water is encountered to collect a water sample.

FD - Field duplicate.
FS - Field split.
MS/MSD - Matrix spike/matrix spike duplicate.
VOC - Volatile organic compound.
SVOC - Semivolatile organic compound.
QA/QC - Quality assurance/quality control.
REG - Field sample.
TAL - Target analyte list.
CL- Chlorinated.
OP - Organphosphate.

2000a). Decontamination of nonsampling equipment will be performed in accordance with the requirements presented in Section 4.10.1.2 of the SAP.

4.4 Surveying of Sample Locations

Sampling locations will be marked with pin flags, stakes, and/or flagging and will be surveyed using either global positioning system (GPS) or conventional civil survey techniques, as necessary, to obtain the required level of accuracy. Horizontal coordinates will be referenced to the U.S. State Plane Coordinate System, Alabama East Zone, North American Datum, 1983. Elevations will be referenced to the North American Vertical Datum of 1988.

Horizontal coordinates for soil, sediment, and surface water locations will be recorded using a GPS to provide accuracy within 1 meter. Because of the need to use permanent monitoring wells to determine water levels, a higher level of accuracy is required. Monitoring wells will be surveyed to an accuracy of 0.1 foot for horizontal coordinates and 0.01 foot for elevations, using survey-grade GPS techniques and/or conventional civil survey techniques, as required. Procedures to be used for GPS surveying are described in Section 4.3 of the SAP. Conventional land survey requirements are presented in Section 4.19 of the SAP.

4.5 Analytical Program

Samples collected at locations specified in this chapter of this SFSP will be analyzed for a specific suite of chemicals and elements based on the history of site usage, as well as EPA, ADEM, FTMC, and USACE requirements. Target analyses for samples collected from the Former Rifle/Machine Gun Ranges, Parcels 100Q and 101Q, consist of the following list of analytical suites:

- Target Analyte List Metals - Method 6010B/7000
- Nitroaromatic and Nitramine Explosives - Method 8330.

In addition, ten percent of the samples will be analyzed for the following list of analytical suites:

- Target Compound List Volatile Organic Compounds – Method 5035/8260B
- Target Compound List Semivolatile Organic Compounds – Method 8270C
- Chlorinated pesticides - Method 8081A
- Chlorinated herbicides - Method 8151A
- Organophosphate pesticides - Method 8141A.

Sediment samples will also be analyzed for the following list of parameters:

- Total Organic Carbon - Method 9060
- Grain Size - ASTM D-421/D-422.

The samples will be analyzed using EPA SW-846 methods, including Update III Methods where applicable, as presented in Table 4-5 in this SFSP and Table 6-1 in the QAP. Data will be reported and evaluated in accordance with CESAS Level B criteria (USACE, 1994) and the stipulated requirements for the generation of definitive data (Section 3.1.2 of the QAP). Chemical data will be reported via hard-copy data packages by the laboratory using Contract Laboratory Program-like forms and electronic copies. These packages will be validated in accordance with EPA National Functional Guidelines by Level III criteria.

4.6 Sample Preservation, Packaging, and Shipping

Sample preservation, packaging, and shipping will follow the procedures specified in Section 4.13.2 of the SAP (IT, 2000a). Completed analysis request/COC records will be secured and included with each shipment of coolers to:

Attn: Elizabeth McIntyre
EMAX Laboratories, Inc.
1835 205th Street
Torrance, California 90501
Telephone: (424) 618-8889.

4.7 Investigation-Derived Waste Management

Management and disposal of the investigation-derived waste (IDW) will follow procedures and requirements described in Appendix D of the SAP (IT, 2000a). The IDW generated at Former Rifle/Machine Gun Ranges, Parcels 100Q and 101Q, is expected to include soil from hollow-stem auger sampling and drill cuttings, purge water from monitoring well development and sampling activities, decontamination fluids, and disposable personal protective equipment. The IDW will be staged in the fenced area surrounding Buildings 335 and 336 while awaiting final disposal.

4.8 Site-Specific Safety and Health

Health and safety requirements for this SI are provided in the SSHP attachment for Former Rifle/ Machine Gun Ranges, Parcels 100Q and 101Q. The SSHP attachment will be used in conjunction with the installation-wide safety and health plan.

Table 4-5

Analytical Samples
Site Investigation
Former Rifle/Machine Gun Range, Parcels 100Q and 101Q
Fort McClellan, Calhoun County, Alabama

Parameters	Analysis Method	Sample Matrix	TAT Needed	Field Samples: No. of Sample Points	No. of Events	No. of Field Samples	QA/QC Samples[a]: Field Dups (10%)	Splits w/ QA Lab (5%)	MS/MSD (5%)	Trip Blank (1/ship)	Eq. Rinse (1/wk/matrix)	EMAX Total No. Analysis	QA Lab Total No. Analysis
Parcels 100Q, and 101Q: 6 water matrix samples (3 groundwater samples and 3 surface water samples); 45 soil matrix samples (21 surface soil samples, 21 subsurface soil samples, and 3 sediment samples)													
All samples will be analyzed for the following parameters:													
TAL Metals	6010B/7000	water	normal	6	1	6	1		1		1	10	0
Nitroaromatic/Nitramine Explosives	8330	water	normal	6	1	6	1		1		1	10	0
TAL Metals	6010B/7000	soil	normal	45	1	45	5		2		2	54	0
Nitroaromatic/Nitramine Explosives	8330	soil	normal	45	1	45	5		2		2	54	0
Approximately 10 % of the samples will be analyzed for the following parameters:													
TCL VOCs	5035/8260B	Water	normal	1	1	1	1		1	2	1	7	0
TCL SVOCs	8270C	Water	normal	1	1	1	1		1		1	5	0
CL Pesticides	8081A	Water	normal	1	1	1	1		1		1	5	0
OP Pesticides	8141A	Water	normal	1	1	1	1		1		1	5	0
Cl Herbicides	8151A	Water	normal	1	1	1	1		1		1	5	0
TCL VOCs	5035/8260B	soil	normal	5	1	5	1		1		2	10	0
TCL SVOCs	8270C	soil	normal	5	1	5	1		1		2	10	0
CL Pesticides	8081A	soil	normal	5	1	5	1		1		2	10	0
OP Pesticides	8141A	soil	normal	5	1	5	1		1		2	10	0
Cl Herbicides	8151A	soil	normal	5	1	5	1		1		2	10	0
Sediment samples only:													
TOC	9060	sediment	normal	3	1	3						3	0
Grain Size	ASTM421/422	sediment	normal	3	1	3						3	0
						138	20	0	17	2	21	211	0

[a]Field duplicate, QA split, and MS/MSD samples were calculated as a percentage of the field samples collected per site and were rounded to the nearest whole number.
Trip blank samples will be collected in association with water matrix samples for VOC analysis only. Assumed four field samples per day to estimate trip blanks. Equipment blanks will be collected once per event whenever sampling equipment is field decontaminated and re-used. They will be repeated weekly for sampling events that are anticipated to last more than 1 week. Assumed 20 field samples will be collected per week to estimate number of equipment blanks.

Ship samples to: EMAX Laboratories, Inc
1835 205th Street
Torrance, CA 90501
Attn: Elizabeth McIntyre
Tel: 424-618-8889
Fax: 424-618-0818

MS/MSD - Matrix spike/matrix spike duplicate.
QA/QC - Quality assurance/quality control.
TAL - Target analyte list.
TOC - Total organic carbon.
ASTM- American Society for Testing and Materials
TCL - Target compound list
VOC - Volatile organic compound
SVOC - Semivolatile organic compound
CL - Chlorinated
OP - Organophosphate

5.0 Project Schedule

The project schedule for the SI activities will be provided by the IT Project Manager to the Base Realignment and Closure Cleanup Team and will be in accordance with the WP.

6.0 References

Environmental Science and Engineering, Inc. (ESE), 1998, ***Final Environmental Baseline Survey, Fort McClellan, Alabama***, prepared for U.S. Army Environmental Center, Aberdeen Proving Ground, Maryland, January.

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ATTACHMENT 1

LIST OF ABBREVIATIONS AND ACRONYMS

List of Abbreviations and Acronyms

2,4-D	2,4-dichlorophenoxyacetic acid
2,4,5-T	2,4,5-trichlorophenoxyacetic acid
2,4,5-TP	silvex
3D	3D International Environmental Group
AbD3	Anniston and Allen gravelly clay loams, 10 to 15 percent slopes, eroded
Abs	skin absorption
AC	hydrogen cyanide
AcB2	Anniston and Allen gravelly loams, 2 to 6 percent slopes, eroded
AcC2	Anniston and Allen gravelly loams, 6 to 10 percent slopes, eroded
AcD2	Anniston and Allen gravelly loams, 10 to 15 percent slopes, eroded
AcE2	Anniston and Allen gravelly loams, 15 to 25 percent slopes, eroded
ACGIH	American Conference of Governmental Industrial Hygienists
ADEM	Alabama Department of Environmental Management
ADPH	Alabama Department of Public Health
AEC	U.S. Army Environmental Center
AEL	airborne exposure limit
AET	adverse effect threshold
AHA	ammunition holding area
AL	Alabama
ALAD	-aminolevulinic acid dehydratase
amb.	Amber
amsl	above mean sea level
ANAD	Anniston Army Depot
AOC	area of concern
APT	armor-piercing tracer
ARAR	applicable or relevant and appropriate requirement
AREE	area requiring environmental evaluation
ASP	Ammunition Supply Point
ASR	Archives Search Report
AST	aboveground storage tank
ASTM	American Society for Testing and Materials
ATSDR	Agency for Toxic Substances and Disease Registry
ATV	all-terrain vehicle
AWARE	Associated Water and Air Resources Engineers, Inc.
AWWSB	Anniston Water Works and Sewer Board
‘B’	Analyte detected in laboratory or field blank at concentration greater than the reporting limit (and greater than zero)
BCF	blank correction factor
BCT	BRAC Cleanup Team
BERA	baseline ecological risk assessment
BEHP	bis(2-ethylhexyl)phthalate
BFB	bromofluorobenzene
BFE	base flood elevation
BG	Bacillus globigii
bgs	below ground surface
BHC	betahexachlorocyclohexane
bkg	background
bls	below land surface
BOD	biological oxygen demand
BRAC	Base Realignment and Closure
Braun	Braun Intertec Corporation
BSC	background screening criterion
BTAG	Biological Technical Assistance Group
BTEX	benzene, toluene, ethyl benzene, and xylenes
BTOC	below top of casing
BTV	background threshold value
BW	biological warfare
BZ	breathing zone; 3-quinuclidinyl benzilate
C	ceiling limit value
Ca	carcinogen
CAB	chemical warfare agent breakdown products
CAMU	corrective action management unit
CCAL	continuing calibration
CCB	continuing calibration blank
CD	compact disc
CDTF	Chemical Defense Training Facility
CEHNC	U.S. Army Engineering and Support Center, Huntsville
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERFA	Community Environmental Response Facilitation Act
CESAS	Corps of Engineers South Atlantic Savannah
CG	carbonyl chloride (phosgene)
CFC	chlorofluorocarbon
CFDP	Center for Domestic Preparedness
ch	inorganic clays of high plasticity
CHPPM	U.S. Army Center for Health Promotion and Preventive Medicine
CK	cyanogen chloride
cl	inorganic clays of low to medium plasticity
Cl.	chlorinated
CLP	Contract Laboratory Program
CN	chloroacetophenone
CNB	chloroacetophenone, benzene, and carbon tetrachloride
CNS	chloroacetophenone, chloropicrin, and chloroform
Co-60	cobalt-60
CoA	Code of Alabama
COC	chain of custody; contaminant of concern
COE	Corps of Engineers
Con	skin or eye contact
COPC	chemical(s) of potential concern
COPEC	chemical(s) of potential environmental concern
CQCSM	Contract Quality Control System Manager
CRL	certified reporting limit
CRZ	contamination reduction zone
Cs-137	cesium-137
CS	ortho-chlorobenzylidene-malononitrile
CSEM	conceptual site exposure model
ctr.	container
CWA	chemical warfare agent
CWM	chemical warfare material; clear, wide mouth
CX	dichloroformoxime
‘D’	duplicate; dilution
DAF	dilution-attenuation factor
DANC	decontamination agent, non-corrosive
ºC	degrees Celsius
ºF	degrees Fahrenheit
DCE	dichloroethene
DDD	dichlorodiphenyldichloroethane
DDE	dichlorodiphenyldichloroethene
DDT	dichlorodiphenyltrichloroethane
DEH	Directorate of Engineering and Housing
DEP	depositional soil
DI	deionized
DID	data item description
DIMP	di-isopropylmethylphosphonate
DMBA	dimethylbenz(a)anthracene
DMMP	dimethylmethylphosphonate
DOD	U.S. Department of Defense
DOJ	U.S. Department of Justice
DOT	U.S. Department of Transportation
DP	direct-push
DPDO	Defense Property Disposal Office
DPT	direct-push technology
DQO	data quality objective
DRMO	Defense Reutilization and Marketing Office
DRO	diesel range organics
DS	deep (subsurface) soil
DS2	Decontamination Solution Number 2
DWEL	drinking water equivalent level
E&E	Ecology and Environment, Inc.
EBS	environmental baseline survey
EC_{50}	effects concentration for 50 percent of a population
ECBC	Edgewood Chemical/Biological Command
EDQL	ecological data quality level
EE/CA	engineering evaluation and cost analysis
Elev.	elevation
EM	electromagnetic
EMI	Environmental Management Inc.
EM31	Geonics Limited EM31 Terrain Conductivity Meter
EM61	Geonics Limited EM61 High-Resolution Metal Detector
EOD	explosive ordnance disposal
EODT	explosive ordnance disposal team
EPA	U.S. Environmental Protection Agency
EPC	exposure point concentration
EPIC	Environmental Photographic Interpretation Center
ER	equipment rinsate

ER-L	effects range-low
ER-M	effects range-medium
ESE	Environmental Science and Engineering, Inc.
ESN	Environmental Services Network, Inc.
ESV	ecological screening value
Exp.	explosives
E-W	east to west
EZ	exclusion zone
FAR	Federal Acquisition Regulations
FB	field blank
FD	field duplicate
FDA	U.S. Food and Drug Administration
FedEx	Federal Express, Inc.
FEMA	Federal Emergency Management Agency
FFE	field flame expedient
Fil	filtered
Flt	filtered
FMDC	Fort McClellan Development Commission
FML	flexible membrane liner
FMP 1300	Former Motor Pool 1300
FOMRA	Former Ordnance Motor Repair Area
Foster Wheeler	Foster Wheeler Environmental Corporation
Frtn	fraction
FS	field split; feasibility study
FSP	field sampling plan
ft	feet
ft/ft	feet per foot
FTA	Fire Training Area
FTMC	Fort McClellan
FTRRA	FTMC Reuse & Redevelopment Authority
g	gram
g/m^3	gram per cubic meter
G-856	Geometrics, Inc. G-856 magnetometer
G-858G	Geometrics, Inc. G-858G magnetic gradiometer
gal	gallon
gal/min	gallons per minute
GB	sarin
gc	clay gravels; gravel-sand-clay mixtures
GC	gas chromatograph
GCL	geosynthetic clay liner
GC/MS	gas chromatograph/mass spectrometer
GCR	geosynthetic clay liner
GFAA	graphite furnace atomic absorption
GIS	Geographic Information System
gm	silty gravels; gravel-sand-silt mixtures
gp	poorly graded gravels; gravel-sand mixtures
gpm	gallons per minute
GPR	ground-penetrating radar
GPS	global positioning system
GS	ground scar
GSA	General Services Administration; Geologic Survey of Alabama
GSBP	Ground Scar Boiler Plant
GSSI	Geophysical Survey Systems, Inc.
GST	ground stain
GW	groundwater
gw	well-graded gravels; gravel-sand mixtures
HA	hand auger
HCl	hydrochloric acid
HD	distilled mustard
HDPE	high-density polyethylene
HEAST	Health Effects Assessment Summary Tables
Herb.	herbicides
HHRA	human health risk assessment
HI	hazard index
HNO_3	nitric acid
HQ	hazard quotient
HQ_{screen}	screening-level hazard quotient
hr	hour
H&S	health and safety
HSA	hollow-stem auger
HTRW	hazardous, toxic, and radioactive waste
‘I’	out of control, data rejected due to low recovery
ICAL	initial calibration
ICB	initial calibration blank
ICP	inductively-coupled plasma
ICRP	International Commission on Radiological Protection
ICS	interference check sample
ID	inside diameter
IDL	instrument detection limit
IDLH	immediately dangerous to life or health
IDM	investigative-derived media
IDW	investigation-derived waste
IEUBK	Integrated Exposure Uptake Biokinetic
ILCR	incremental lifetime cancer risk
IMPA	isopropylmethyl phosphonic acid
IMR	Iron Mountain Road
in.	inch
Ing	ingestion
Inh	inhalation
IP	ionization potential
IPS	International Pipe Standard
IRDMIS	Installation Restoration Data Management Information System
IRIS	Integrated Risk Information Service
IRP	Installation Restoration Program
ISCP	Installation Spill Contingency Plan
IT	IT Corporation
ITEMS	IT Environmental Management System ™
‘J’	estimated concentration
JeB2	Jefferson gravelly fine sandy loam, 2 to 6 percent slopes, eroded
JeC2	Jefferson gravelly fine sandy loam, 6 to 10 percent slopes, eroded
JfB	Jefferson stony fine sandy loam, 0 to 10 percent slopes have strong slopes
JPA	Joint Powers Authority
K	conductivity
K_{ow}	octonal-water partition coefficient
L	lewisite; liter
LC_{50}	lethal concentration for 50 percent of population tested
LD_{50}	lethal dose for 50 percent of population tested
l	liter
LBP	lead-based paint
LCS	laboratory control sample
LC_{50}	lethal concentration for 50 percent population tested
LD_{50}	lethal dose for 50 percent population tested
LEL	lower explosive limit
LOAEL	lowest-observed-advserse-effects-level
LT	less than the certified reporting limit
LUC	land-use control
LUCAP	land-use control assurance plan
LUCIP	land-use control implementation plan
max	maximum
MCL	maximum contaminant level
MCPA	4-chloro-2-methylphenoxyacetic acid
MDC	maximum detected concentration
MDCC	maximum detected constituent concentration
MDL	method detection limit
mg	milligrams
mg/kg	milligrams per kilogram
mg/kg/day	milligram per kilogram per day
mg/kgbw/day	milligrams per kilogram of body weight per day
mg/L	milligrams per liter
mg/m^3	milligrams per cubic meter
mh	inorganic silts, micaceous or diatomaceous fine, sandy or silt soils
MHz	megahertz
µg/g	micrograms per gram
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
µmhos/cm	micromhos per centimeter
min	minimum
MINICAMS	miniature continuous air monitoring system
ml	inorganic silts and very fine sands
mL	milliliter
mm	millimeter
MM	mounded material
MMBtu/hr	million Btu per hour
MOGAS	motor vehicle gasoline

List of Abbreviations and Acronyms *(Continued)*

MPA	methyl phosphonic acid
MPM	most probable munition
MR	molasses residue
MS	matrix spike
mS/cm	millisiemens per centimeter
MSD	matrix spike duplicate
MTBE	methyl tertiary butyl ether
msl	mean sea level
MtD3	Montevallo shaly, silty clay loam, 10 to 40 percent slopes , severely eroded
mV	millivolts
MW	monitoring well
Na	sodium
NA	not applicable; not available
NAD	North American Datum
NAD83	North American Datum of 1983
NAVD88	North American Vertical Datum of 1988
NAS	National Academy of Sciences
NCP	National Contingency Plan
ND	not detected
NE	no evidence; northeast
ne	not evaluated
NEW	net explosive weight
NFA	No Further Action
ng/L	nanograms per liter
NGVD	National Geodetic Vertical Datum
Ni	nickel
NIC	notice of intended change
NIOSH	National Institute for Occupational Safety and Health
NLM	National Library of Medicine
NPDES	National Pollutant Discharge Elimination System
NPW	net present worth
No.	number
NOAA	National Oceanic and Atmospheric Administration
NOAEL	no-observed-adverse-effects-level
NR	not requested; not recorded; no risk
NRC	National Research Council
NRCC	National Research Council of Canada
ns	nanosecond
N-S	north to south
NS	not surveyed
nT	nanotesla
NTU	nephelometric turbidity unit
nv	not validated
O&G	oil and grease
O&M	operation and maintenance
OB/OD	open burning/open detonation
OD	outside diameter
OE	ordnance and explosives
oh	organic clays of medium to high plasticity
ol	organic silts and organic silty clays of low plasticity
OP	organophosphorus
ORP	oxidation-reduction potential
OSHA	Occupational Safety and Health Administration
OSWER	Office of Solid Waste and Emergency Response
OWS	oil/water separator
oz	ounce
PA	preliminary assessment
PAH	polynuclear aromatic hydrocarbon
Parsons	Parsons Engineering Science, Inc.
Pb	lead
PCB	polychlorinated biphenyl
PCE	perchloroethene
PCP	pentachlorophenol
PDS	Personnel Decontamination Station
PEL	permissible exposure limit
PES	potential explosive site
Pest.	pesticides
PETN	pentarey thritol tetranitrate
PFT	portable flamethrower
PG	professional geologist
PID	photoionization detector
PkA	Philo and Stendal soils local alluvium, 0 to 2 percent slopes
POL	petroleum, oils, and lubricants
POW	prisoner of war
PP	peristaltic pump
ppb	parts per billion
PPE	personal protective equipment
ppm	parts per million
PPMP	Print Plant Motor Pool
ppt	parts per thousand
PR	potential risk
PRG	preliminary remediation goal
PSSC	potential site-specific chemical
pt	peat or other highly organic silts
PVC	polyvinyl chloride
QA	quality assurance
QA/QC	quality assurance/quality control
QAP	installation-wide quality assurance plan
QC	quality control
QST	QST Environmental, Inc.
qty	quantity
Qual	qualifier
‘R’	rejected data; resample
R&A	relevant and appropriate
RAO	removal action objective
RBC	risk-based concentration
RCRA	Resource Conservation and Recovery Act
RD	remedial design
RDX	cyclonite
RfD	reference dose
ReB3	Rarden silty clay loams
REG	regular field sample
REL	recommended exposure limit
RFA	request for analysis
RGO	remedial goal option
RI	remedial investigation
RL	reporting limit
RPD	relative percent difference
RRF	relative response factor
RSD	relative standard deviation
RTECS	Registry of Toxic Effects of Chemical Substances
RTK	real-time kinematic
SAD	South Atlantic Division
SAE	Society of Automotive Engineers
SAIC	Science Applications International Corporation
SAP	installation-wide sampling and analysis plan
sc	clayey sands; sand-clay mixtures
Sch.	Schedule
SCM	site conceptual model
SD	sediment
SDG	sample delivery group
SDZ	safe distance zone; surface danger zone
SEMS	Southern Environmental Management & Specialties, Inc.
SFSP	site-specific field sampling plan
SGF	standard grade fuels
SHP	installation-wide safety and health plan
SI	site investigation
SL	standing liquid
SLERA	screening-level ecological risk assessment
sm	silty sands; sand-silt mixtures
SM	Serratia marcescens
SOP	standard operating procedure
sp	poorly graded sands; gravelly sands
SP	submersible pump
SQRT	screening quick reference tables
Sr-90	strontium-90
SRA	streamlined human health risk assessment
Ss	stony rough land, sandstone series
SS	surface soil
SSC	site-specific chemical
SSHO	site safety and health officer
SSHP	site-specific safety and health plan
SSL	soil screening level
SSSL	site-specific screening level

List of Abbreviations and Acronyms *(Continued)*

SSSSL	site-specific soil screening level
STB	supertropical bleach
STC	source term concentration
STEL	short-term exposure limit
STOLS	Surface Towed Ordnance Locator System®
Std. units	standard units
SU	standard unit
SUXOS	senior UXO supervisor
SVOC	semivolatile organic compound
SW	surface water
SW-846	U.S. EPA's *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods*
SWPP	storm water pollution prevention plan
SZ	support zone
TAL	target analyte list
TAT	turn around time
TB	trip blank
TBC	to be considered
TCA	trichloroethane
TCDD	2,3,7,8-tetrachlorodibenzo-p-dioxin
TCDF	tetrachlorodibenzofurans
TCE	trichloroethene
TCL	target compound list
TCLP	toxicity characteristic leaching procedure
TDGCL	thiodiglycol
TDGCLA	thiodiglycol chloroacetic acid
TERC	Total Environmental Restoration Contract
TIC	tentatively identified compound
TLV	threshold limit value
TN	Tennessee
TNT	trinitrotoluene
TOC	top of casing; total organic carbon
TPH	total petroleum hydrocarbons
TRADOC	U.S. Army Training and Doctrine Command
TRPH	total recoverable petroleum hydrocarbons
TSCA	Toxic Substances Control Act
TSDF	treatment, storage, and disposal facility
TWA	time-weighted average
UCL	upper confidence limit
UCR	upper certified range
'U'	not detected above reporting limit
USACE	U.S. Army Corps of Engineers
USACHPPM	U.S. Army Center for Health Promotion and Preventive Medicine
USAEC	U.S. Army Environmental Center
USAEHA	U.S. Army Environmental Hygiene Agency
USACMLS	U.S. Army Chemical School
USAMPS	U.S. Army Military Police School
USATCES	U.S. Army Technical Center for Explosive Safety
USATEU	U.S. Army Technical Escort Unit
USATHAMA	U.S. Army Toxic and Hazardous Material Agency
USC	United States Code
USCS	Unified Soil Classification System
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey
UST	underground storage tank
UTL	upper tolerance level
UXO	unexploded ordnance
UXOQCS	UXO Quality Control Supervisor
UXOSO	UXO safety officer
V	vanadium
VOA	volatile organic analyte
VOC	volatile organic compound
VOH	volatile organic hydrocarbon
VQlfr	validation qualifier
VQual	validation qualifier
VX	nerve agent (O-ethyl-S-[diisopropylaminoethyl]-methylphosphonothiolate)
Weston	Roy F. Weston, Inc.
WP	installation-wide work plan
WS	watershed
WSA	Watershed Screening Assessment
WWI	World War I
WWII	World War II
XRF	x-ray fluorescence
yd^3	cubic yards

<u>SAIC – Data Qualifiers, Codes and Footnotes, 1995 Remedial Investigation</u>

N/A – Not analyzed

ND – Not detected

Boolean Codes

LT – Less than the certified reporting limit

Flagging Codes

9 – Non-demonstrated/validated method performed for USAEC

B – Analyte found in the method blank or QC blank

C – Analysis was confirmed

D – Duplicate analysis

I – Interfaces in sample make quantitation and/or identification to be suspicious

J – Value is estimated

K – Reported results are affected by interfaces or high background

N – Tentatively identified compound (match greater than 70%)

Q – Sample interference obscured peak of interest

R – Non-target compound analyzed for but not detected (GC/MS methods)

S – Non-target compound analyzed for and detected (GC/MS methods)

T – Non-target compound analyzed for but not detected (non GC/MS methods)

U – Analysis in unconfirmed

Z – Non-target compound analyzed for and detected (non-GC/MS methods)

Qualifiers

J – The low-spike recovery is low

N – The high-spike recovery is low

R – Data is rejected